AFRL-VS-TR-2001-1579

VALIDATION REPORT FOR THE CELESTIAL BACKGROUND SCENE DESCRIPTOR (CBSD) STELLAR POINT SOURCES MODEL CBSKY4

Dr. Paul V. Noah
Ms. Meg Noah

Mission Research Corporation
589 West Hollis Street, Suite 201
Nashua, NH 03062-1323

February 2001

Scientific Report No. 9

APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED

AIR FORCE RESEARCH LABORATORY
Space Vehicles Directorate
29 Randolph Rd
AIR FORCE MATERIEL COMMAND
Hanscom AFB, MA 01731-3010

This technical report has been reviewed and is approved for publication

/Signed/
STEPHAN PRICE
Contract Manager

/Signed/
ROBERT BELAND
Branch Chief

REPORT DOCUMENTATION PAGE	*Form Approved* *OMB NO. 0704.0188*

1. AGENCY USE ONLY *(Leave Blank)*	2. REPORT DATE February 2001	3. REPORT TYPE AND DATES COVERED Scientific Report No. 9 1 Apr 00 – 29 Dec 00

4. TITLE AND SUBTITLE

Validation Report for the Celestial Background Scene Descriptor (CBSD) Stellar Point Source Model CBSKY4

5. FUNDING NUMBERS

Contract F19628-93-C-0028
PE: 63215C
PR: S321
TA: GG
WU: AA

6. AUTHOR(s)

Paul Noah
Meg Noah
Mission Research Corp. – Nashua, NH 03062

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

Mission Research Corporation
589 West Hollis Street, Suite 201
Nashua, NH 03062-1323

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

Air Force Research Laboratory
29 Randolph Road
Hanscom AFB, MA 01731
Contract Manager: Dr. Steven Price

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

AFRL/VS-TR-2001-1579

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT

Approved for Public Release; distribution unlimited

12b. DISTRIBUTION CODE

ABSTRACT *(Maximum 200 words)*

This report provides detailed information on the evolving improvements and verification of the AFRL/HRS Celestial Background Scene Descriptor (CBSD)Stellar Point Sources code (CBSKY4). The CBSKY4 model produces infrared signatures of point sources, most of which are part of our galaxy. CBSKY4 is currently in use by the MDA as a component of the SSGM simulation package and as part of the AFRL PLEXUS R3V2 atmospheric effects modeling suite.

14 SUBJECT TERMS

Celestial, Infrared, Visible, Modeling, Stars

15. NUMBER OF PAGES

199

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	None

Table of Contents

List of Figures

List of Tables

1. Background

Since its inception, the primary goal of the Celestial Background Scene Descriptor (CBSD) development is the generation of high-fidelity, physics-based celestial simulations to support National Missile Defense research and sensor design engineering requirements. This report focuses on one component of CBSD, the CBSKY4 model. CBSKY4 models emissions from stellar point sources. CBSKY4 is thus one of the key NMD tools for modeling one of the most important sources of clutter in the celestial background.

2. Model Description

Sponsor:	Air Force Research Laboratory
Author:	Paul Noah Mission Research Corporation One Tara Blvd., Suite 302 Nashua, NH 03062 Phone: 603-891-0070 x 208 FAX: 603-891-0088 email: pnoah@mrcnh.com
Othe MDA ProgramUsers:	MSX, PLEXUS, SSGM, SBIRS (High) These programs collectively have several hundred users in the defense research industry.
Current Version:	CBSKY4 v1.09 28 July 2000

The CBSKY4 module generates images of the point sources in the sky. For CBSD, point source models are represented by the statistical distribution of 87 spectral classes of stars for arbitrary bandpasses between 2 and 40 microns, and for the pre-defined bandpass filters of B, V, J, H, K, and at 1400 Å, at 1565 Å, at 1660 Å, at 2.4 microns, at 12 microns, and at 25 microns. The CBSKY4 module achieves this by using a combination of in-band flux estimates of bright stars listed in star catalogs and statistically generated stars based on expected stellar densities for each location in the sky. Options to include dense star counts in regions of Giant Molecular Clouds and to exclude star counts in dark regions are also provided.

The CBSD input scenario definition is flexible to suit a wide variety of applications. Any number of celestial coordinate systems can be selected to define the stare point. The specifications of a hypothetical sensor are also flexible, providing the option of using wavelength dependent filter response functions, the specification of array size, pixel size, and the application of different functions to simulate the MTF of the sensor's optics.

The output image and statistics can be customized to fit a variety of applications. The images and tabulated statistical output generated from CBSKY4 have user-defined map projections, coordinate systems, and flux units.

2.1 Operational Overview

The CBSD suite currently represents celestial phenomenology through independent software components that produce infrared signatures of one class of celestial objects. Each model computes the position and flux of celestial objects handled by that model. The components do not interact, and output is synthesized into a description of the real world celestial background through simple co-adding of fluxes with simple masking. The CBAMP model produces infrared signatures of the asteroids, moon, and planets. The CBZODY model produces infrared signatures arising from zodiacal dust in the solar system. The CBSKY4 model produces infrared signatures of point sources, most of which are part of our galaxy. Other components in progress produce signatures of HII regions, galaxies, planetary nebulae, celestial cirrus, and other extended sources that can have significant infrared flux values.

The CBSKY4 code runs as a stand-alone command line program, with no graphical interface. All user inputs are defined in text files. The CBSKY4.inp file is a Windows INI file format with sets of initialization variables, their values, and optional comment fields, all grouped under section headings for easy editing. There are no command line options or variables. The program uses input text files and binary data files built by the user when installing the software. These are described in the CBSD user manual. A separate reference manual provides detailed information about each input variable.

Alternatively, the CBSKY4 may be accessed through the CBSD control component that drives all the models and synthesizes their outputs into a single representation of the celestial background as a whole.

2.2 Intended Use

The CBSKY4 model is intended to be used by sensor systems designers who have a requirement to simulate the celestial background. It is not specifically optimized for hardware-in-the-loop operations and that has not been a goal of CBSD; however, it could be used for this type of simulation. It has been included in other large simulation platforms such as SSGM. The code could be parallelized and it could be run remotely in a distributed environment.

2.3 Limitations of CBSKY4

Known limitations of the CBSKY4 component are:

- Binary stars and other star systems are not modeled.
- Molecular clouds are only modeled for the 12 μm band and the 25 μm band.
- Variable stars (light curve variations in time) are not modeled.
- Polarization is not modeled.
- Multi-spectral star maps of statistical stars are limited.
- The star catalogs represent only visible and IRAS; however, the software is extensible. There are plans to include the 2MASS star catalog.
- Galactic extinction is included to the degree that it is known.
- Proper Motion of stars is not modeled.

- Stellar parallax of nearby stars is not included. Table 1 lists parallaxes of some nearby stars.

Table 1: Some Stellar Parallax Measurements

Star	Parallax	Distance (parsecs)
α Centauri	0".75	1.3
Barnard	0".55	1.8
61 Cygni	0".29	3.5

To date, no AFRL requirements have been compromised by these limitations, as they are irrelevant to the current domain of intended users of the CBSKY4 model. An exception to this is the goal to have multi-spectral star maps of the statistical stars. The algorithm for that enhancement is currently under development.

3. Approach to Model Validation

3.1 Philosophy

Ideally, model validation involves the comparison of model predictions with real measurement data. Validation can be achieved by determining the degree to which a model is an accurate representation of the real world from the perspective of the intended application of the model. Experts establish what aspects of the real world are relevant, and which measurements are to be taken as truth. The selection of which measurement data to use as the basis of truth is somewhat subjective.

To validate the model, its operation must be analyzed to verify that its overall design is realistic and representative of the key aspects of its intended use. This is somewhat subjective. Then the model is subjected to regression tests to quantify the degree to which its predictions match truth. The degree of match can be quantified using statistics.

Model validation also involves verifying that the documented installation procedure runs as expected and that the software is flexible, extensible, maintainable, and easily ported to new systems.

3.2 Validation Basis

The following benchmarks were used to validate CBSKY4:

- **Martin Cohen's SKY4 model.** This model provides the real world representations of star counts as a function of magnitude or flux bin for any line-of-sight in the sky. The degree to which SKY4 matches astronomical measurements is beyond the scope of our effort. To date, SKY4 is the most complete, non-biased representation of astronomical star counts for the whole sky. SKY4 is based on numerous star censuses, surveys, and regional studies. It is a software compendium of over 30 years of star population measurements.

- **The Yale Bright Star Catalog.** This catalog is a real world representation of the bright visible stars, their positions, spectral types and magnitudes. The YBSC is accurate and represents a non-biased sampling of the whole visible sky.
- **Compilation of IRAS and MSX supplement to IRAS star catalogs.** These are a real world representation of the bright infrared stars, their positions, spectral types, and magnitudes. This compilation is an accurate measurement that provides a non-biased sampling of the whole infrared sky, with the known exceptions of the galactic plane and Magellanic clouds.

Thus, the validation effort reported here focuses on the level to which the CBSKY4 predictions match these benchmark astronomical catalogs. Comparison to additional astronomical measurements may be discussed only to provide greater confidence that the code is performing properly.

3.3 Scope of Our Effort

In this section, we will summarize the CBSKY4 validation efforts using the following processes:

- **Predictive Validation of Stellar Distributions**
  Validating that CBSKY4 accurately predicts a stellar distribution is the heart of this document. This involves comparing model output to the "real world" or "ground truth." For CBSKY4, Martin Cohen's SKY4 model is taken as truth, and the bulk of this effort is verifying that CBSKY4 produces the same statistical distributions of stars as the SKY4 model.
- **Implementation of Star Catalogs**
  Here, we validate that the star catalog data is read and interpreted, and that units of flux and position are consistently carried through the program execution for final star placement. We also validate that when star catalog data are synthesized with statistical stars, the statistical distributions of bright stars are not skewed.
- **Predictive Positional Validation**
  This involves validating the different coordinate systems and map projections in which output data are represented. The CBSD suite has a 2-arcsecond positional accuracy. The geometry modules provide options of galactic, equatorial and ecliptic coordinates, reckoned to the users equinox, and projected into arrays with rectangular, gnomonic, or Mollweide projections.
- **Predictive Flux Validation**
  Here, the flux values are validated for the different unit options, bandpass options, and convolution options.
- **Code Operation Validation**
  Systematically, the code inputs are varied to validate that the input parameters result in the expected code performance. At this level, the fidelity of the output position and fluxes are not analyzed to any great extent, rather, we want to validate that when an output file is selected, it is produced.
- **Acceptance Regression Validation**
  Since CBSKY4 is a new code, we developed a suite of code inputs and outputs against

which future versions are tested to verify that modifications made to the code did not corrupt or compromise features of the present code.

- **Documentation Validation**
  The CBSKY4 code is complete with a user's manual, a reference manual, and other documentation that includes example cases for users to run. We validate that the code produces the results published in these documents.

4. Model Validation Results

The following sections outline our rationale for validation, and our qualitative and quantitative assessment of the performance of the model.

4.1 SKY4 Description

The Cohen SKY4 model is a stand-alone FORTRAN code that models the counts per magnitude bin for an arbitrary line-of-sight at any location in the sky. The code produces histograms of star counts per magnitude bin for arbitrary rectangular regions in the sky and for pre-defined bandpasses and arbitrary bandpasses. The code optionally outputs the star counts on a component or source basis for the following galactic structures:

- The disk
- The bulge
- The spheroid
- The spiral arms (including the 'local arm')
- The molecular ring, and
- The extragalactic sky (distant galaxies).

Other code features:

- The default solar displacement from the galactic plane (15 parsecs North) can be overridden.
- Surface brightness (flux describing extended sources including confused regions) can be output.
- Computation of total flux in an area (flux arising from all the stars in a region).
- Bandpass options: B, V, J. K, 2.4 μm, 12 μm, 25 μm, 1565 Å, 1400 Å, 1660 Å, user-defined 2-30 micron response filter.

Star counts for giant molecular clouds (for the 12 μm band or the 25 μm band), galactic extinction, and absent regions are included in the modeling.

The output of Cohen's SKY4 is a set of text files. The file SKY4.OUT is a two-column text file. The first column is the magnitude or flux bins. The second column is the differential or cumulative Log(N) star counts. The Sky4.Log file is also a text file. The input parameter values are listed as well as numbers like the total FOV size in square degrees.

4.1.1 Cohen's Spectral Classes

The spectral classification scheme used by CBSKY4 is based on the work of Martin Cohen (1993, 1994a, 1994b). Martin Cohen defined his spectral classification system for the program SKY4. Cohen's classification system includes 87 spectra templates. There are 33 normal stellar types; 42 types of AGB star, both oxygen and carbon rich; six types of objects that are distinct from others only by their midinfrared high luminosity; and six types of exotica including T Tau stars, HII regions, planetaries, and reflection nebulae. Their relationship to standard spectral types published in other catalogs is presented in Table 2.

Table 2: Cohen Spectral Classification Types

Cohen Number	Related Spectral Type	Cohen Number	Related Spectral Type	Cohen Number	Related Spectral Type
1	B0,1 V	30	YOUNG OB	59	AGB C 25
2	B2,3 V	31	A-G I-II	60	AGB CI 01
3	B5 V	32	K-M2 I-II	61	AGB CI 03
4	B8-A0 V	33	M3-4 I-II	62	AGB CI 05
5	A2-5 V	34	AGB M 01	63	AGB CI 07
6	F0-5 V	35	AGB M 03	64	AGB CI 09
7	F8 V	36	AGB M 05	65	AGB CI 11
8	G0-2 V	37	AGB M 07	66	AGB CI 13
9	G5 V	38	AGB M 09	67	AGB CI 15
10	G8-K3 V	39	AGB M 11	68	AGB CI 17
11	K4-5 V	40	AGB M 13	69	AGB CI 19
12	M0-1 V	41	AGB M 15	70	AGB CI 21
13	M2-3 V	42	AGB M 17	71	AGB CI 23
14	M4-5 V	43	AGB M 19	72	AGB CI 25
15	M late V	44	AGB M 21	73	AGB CI 27
16	F8-G2 III	45	AGB M 23	74	AGB CI 29
17	G5 III	46	AGB M 25	75	AGB CI 31
18	G8 III	47	AGB C 01	76	X 1E
19	K0,1 III	48	AGB C 03	77	X 1A
20	K2,3 III	49	AGB C 05	78	X 2
21	K4,5 III	50	AGB C 07	79	X 3
22	M0 III	51	AGB C 09	80	X 4
23	M1 III	52	AGB C 11	81	X 5
24	M2 III	53	AGB C 13	82	PN BLUE
25	M3 III	54	AGB C 15	83	PN RED
26	M4 III	55	AGB C 17	84	RN BLUE
27	M5 III	56	AGB C 19	85	RN RED
28	M6 III	57	AGB C 21	86	H II REG
29	M7 III	58	AGB C 23	87	T TAURI

Every category of source has its own set of absolute magnitudes in the hardwired bandpasses; its own dispersion of M12; its own individual scale height and volume density in the local solar neighborhood. Some sources may be absent from specific galactic structures. The galactic arms and ring have higher populations of high-mass stars whereas the galactic halo does not.

4.1.2 Log(N) vs. Log(S) Plots

Star counting and star cataloging of positions and magnitudes of bright stars dates back to antiquity; however, only in the last few hundred years has star counting been used to infer the shape and size of our galaxy.

Based primarily on star counts, this is our present view of the Milky Way galaxy:

- The main portion of stars form a flat disk about 30 kpc in diameter.
- This disk contains spiral arms.
- The outer portions of the center of the galaxy can be viewed as bright swarms of stars in Scorpio and Sagittarius.
- The disk is surrounded by a considerably less flattened halo, which contains the globular clusters and certain types of individual stars. Halo objects, sometimes referred to as high velocity stars, follow elliptical orbits about the galactic center; their relative velocities with respect to the Sun are 100-300 km/s.
- Our solar system is about 9 kpc from the center of the galaxy. The Sun orbits the galactic center every ~250 million years at a velocity of ~220 km/s.
- The galactic center is hidden from Earth's view by thick, dark interstellar clouds.
- The whole system is about $2 \cdot 10^{11}$ solar masses.

4.1.3 Magnitude Defined

CBSKY4 output magnitudes are apparent magnitudes. Apparent magnitude is the measure of how bright a star appears, and magnitude differences between stars measure the relative brightness of stars. The most negative magnitude numbers correspond to the brightest objects, while the largest positive numbers correspond to the faintest objects.

Apparent magnitudes are defined for a specified spectral region. Astronomers traditionally speak of visual magnitudes, or brightness as the human eye would perceive it. Magnitudes output in CBSKY4 are reported for the spectral region defined by the user.

The following formula relates magnitude and brightness:

$$(m_2 - m_1) = 2.5 \log(b_1/b_2)$$

$$(m_1 - m_2) = -2.5 \log(b_1/b_2)$$

where m_1 and b_1 are the magnitude and brightness of object 1 and m_2 and b_2 are the magnitude and brightness of object 2.

To convert magnitudes to brightness values, one needs a reference object, typically reported as the flux at magnitude zero. Using,

$$m = -2.5 \log(F / F_0)$$

with F_0 being the flux at magnitude zero, and F being the flux of the star, the magnitude, m, of the star can be computed. Conversely, the flux can be computed from the magnitude:

$$F = F_0 \cdot 10^{-m/2.5}$$

Table 3 illustrates the relative differences in apparent magnitudes of objects through familiar examples.

Table 3: Comparison of Apparent and Absolute Magnitudes

Object	Apparent Visual Magnitude	Absolute Magnitude
The Sun	-26.8	4.8
100 Watt Bulb at 3 m	-18.7	66.3
Full Moon	-12.5	32
Venus (at brightest)	-4.4	28
Sirius (brightest star)	-1.5	1.4
Alpha Centauri (closest star)	-0.04	4.4
Andromeda Galaxy (farthest seeable object)	3.5	-21
Faintest naked eye stars	6-7	------
Faintest star visible from Earth telescopes	~25	------

The absolute magnitude is a measure of the energy produced by a star or object. It is defined as the apparent magnitude of the star if the star were located at a standard distance of 10 parsecs from the observer. Absolute magnitudes can be inferred from the spectrum of a star.

Apparent magnitude values are the result of both the intrinsic brightness of the star (which is related to its internal energy production) and the effect of distance (which has nothing to do with the intrinsic structure of the star). The inverse square law of brightness can be used to infer distances to stars. The difference between the absolute magnitude, M, and the apparent magnitude, m, and is known as the distance modulus (m-M):

$$m - M = 5.0 \log (D/10.0)$$

where D is the distance between the observer and the object in parsecs. If a star's distance cannot be computed from parallax or other means, this formula is often used.

4.1.4 The Use of Log(N) vs. Log(S) Plots

The stellar density of the sky for a given sky region is defined by the Log(N) vs. Log(S) values. The Log(N) is the logarithm of the number of stars in a given magnitude bin; the Log(S) is the logarithm of the flux, or the magnitude of the stars. Further, the Log(S) values are quantized into bins of equal (apparent) magnitude.

For a cumulative Log(N) vs. Log(S) plot, the x-axis is the magnitude bin and the y-axis is the logarithm of the number of stars brighter than or equal to that magnitude. The curve is the logarithm of the cumulative histogram of star counts.

For a differential Log(N)/m vs. Log(S) plot, the x-axis is the magnitude bin and the y-axis is the number of stars per magnitude bin for that magnitude. It is not a histogram of the number of stars in that magnitude bin.

For validating the stellar distributions produced by CBSKY4, Log(N) vs. Log(S) plots are created by overlaying the SKY4 results (our "truth" data) with the CBSKY4 results for a given

region and bandpass and other code parameters. The plots are visually compared to subjectively determine that CBSKY4 is reproducing SKY4 stellar densities.

Unless otherwise noted, the CBSKY4 model was run for statistical stars (including molecular clouds) only with real or catalog stars not included. While many bandpasses were compared for select regions, the majority of the comparisons were run for two fiducial bands: the K and the 12μm bands.

4.1.5 Validation Results For Select Regions

The set of validation regions discussed in this section were selected on the basis of their inclusion in Martin Cohen's publications about the SKY4 model improvements. These regions are presumed to have significant features in the bandpasses and for the FOV size reported. For all of these regions, two pre-defined bands were selected as the basis for all star distribution validations. The two fiducial bands chosen were the K and the 12μm bands.

Regions in Cohen (1993) were first selected. A complete set of Log(N) vs. Log(S) plots is given in Appendix A. Table 4 lists these regions and parameters used for the validation. Comparison plots were generated for the K band and for the 12μm band.

Table 4: May 1993 Test Regions (K and 12μm band)

Galactic Latitude [degrees]	Galactic Longitude [degrees]	Field-of-Regard [square degrees]
90.0	90.0	1.0
0.0	80.0	10.0
0.02	0.08	1.0
0.46	19.93	1.0
0.13	10.42	1.0
0.08	29.26	1.0
0.07	39.96	1.0
0.09	59.7	1.0
0.16	49.68	1.0

The output of the l=10.43 b=0.13) case is shown in the Figure 1. As Log(N) approaches zero, the CBSKY4 model is confounded by fractional star counts. Unable to place a fraction of a star, when Log(N) becomes less than or equal to zero, CBSKY4 assigns a single star to a single bright magnitude bin so that the Log(N=0) magnitude is the same on both curves. The results for the K band image below show the single bright star placement. These curves show excellent agreement between CBSKY4 and SKY4 statistical stars.

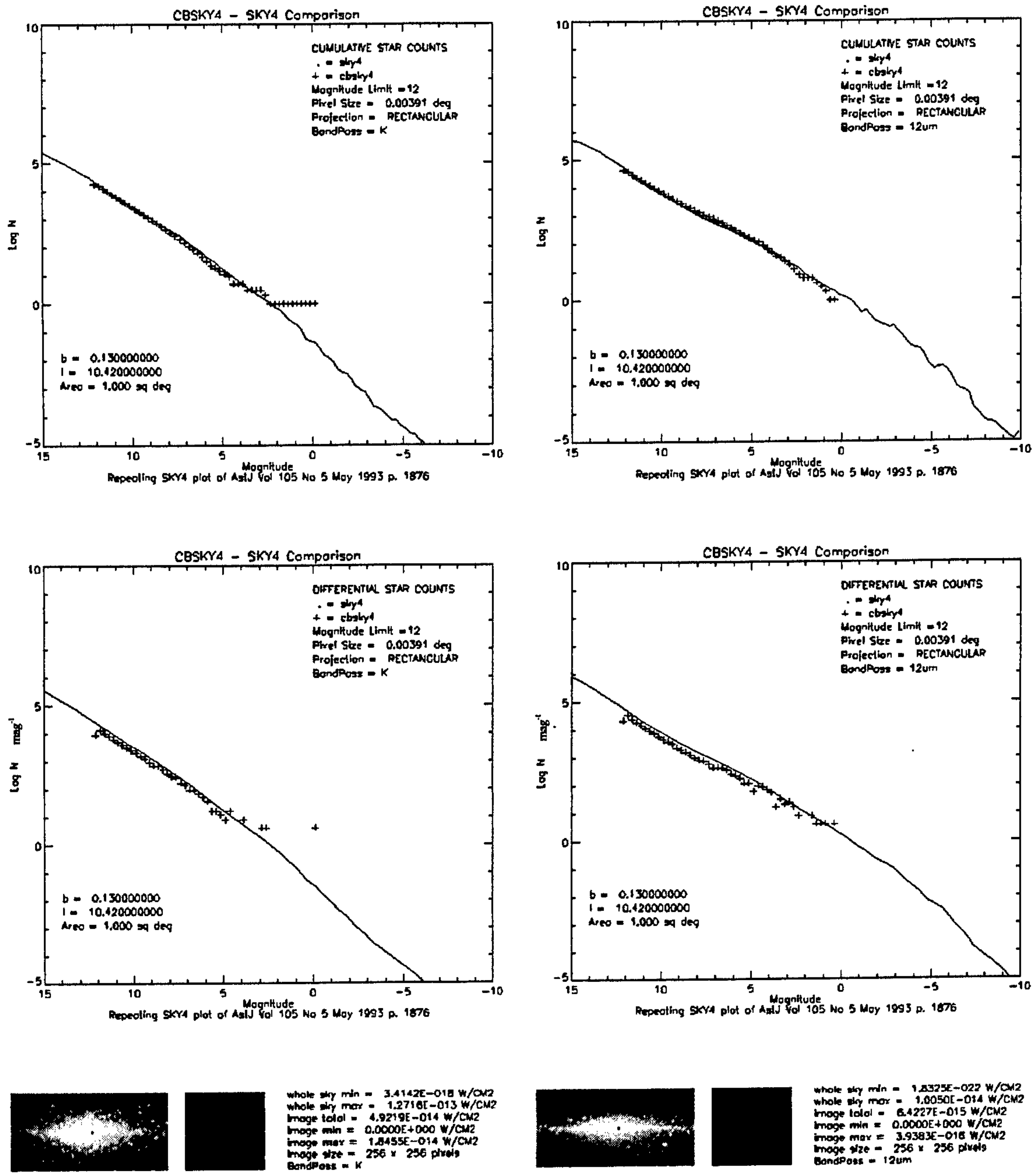


Figure 1: SKY4 - CBSKY4 comparison for l = 10.42, b = 0.13.

The next set of validation regions were regions used in Cohen (1994a). A complete set of Log(N) vs. Log(S) plots is given in Appendix B. Table 5 lists the regions and parameters used for the validation. Note that Cohen's paper uses different bandpasses to describe the new ultraviolet extensions to his code; however, since this validation report focuses on the K and 12 μm bands, the bandpasses used here are different in some cases. Comparison plots were generated for the bands listed. The Appendix B plots all show agreement between model prediction and observation.

Table 5: February 1994 Test Regions

Galactic Latitude (deg.)	Galactic Longitude (deg.)	Field-of-Regard (sq. deg)	Bandpass
0.0	80.0	10.0	25 μm
1.25	107.5	22.49	12 μm
-3.9	1.00	0.9977	B
-3.9	1.00	0.9977	V
-70.0	342.0	0.3420	12 μm
55	73	0.5736	12 μm
-52.0	223.0	0.6157	12 μm
-70.0	342.0	2.241	12 μm
-60.0	194.0	3.277	12 μm
55.0	73.0	3.759	12 μm
-52.0	223.0	4.035	12 μm
-43.5	345.0	4.754	12 μm
-13.0	333.0	6.386	12 μm
-10.0	5.50	6.454	12 μm
-9.0	83.50	6.43	12 μm

4.1.6 Validation Results For Zoom-In On Selected Confused Regions

The code was tested for its ability to reproduce statistics in confused regions from very large FOV to very small FOV. The code positional accuracy is reported to be 2 arc seconds. At that resolution, most FOV will have stellar densities of less than one star. Each line-of-sight was run for a single pixel with the following angular extents (in degrees): {10, 5.555, 1, .5555, 0.1, 0.05555, 0.01, 0.005555, 0.001, 0.0005555} and in all cases, smaller FOV produced fewer than one star. Most FOV produced fewer than one star at the 0.001 degree angular extent. The K band and 12 μm band runs were made for the following central lines-of-sight. A total of 120 comparisons were made (6 centers, 2 bands, 10 FOV) for zooming in on a confused region (Table 6). All of the comparison plots are provided in Appendix C.

Table 6: Confused-Region Centers for Zoom-In

Galactic Latitude [degree]	Galactic Longitude [degree]
3.0	0.0
3.0	28.0
-3.0	0.0
-3.0	28.0
0.0	0.0
0.0	28.0

Figure 2 shows that the CBSKY4 model mirrors the SKY4 results even for very small FOV on the galactic center.

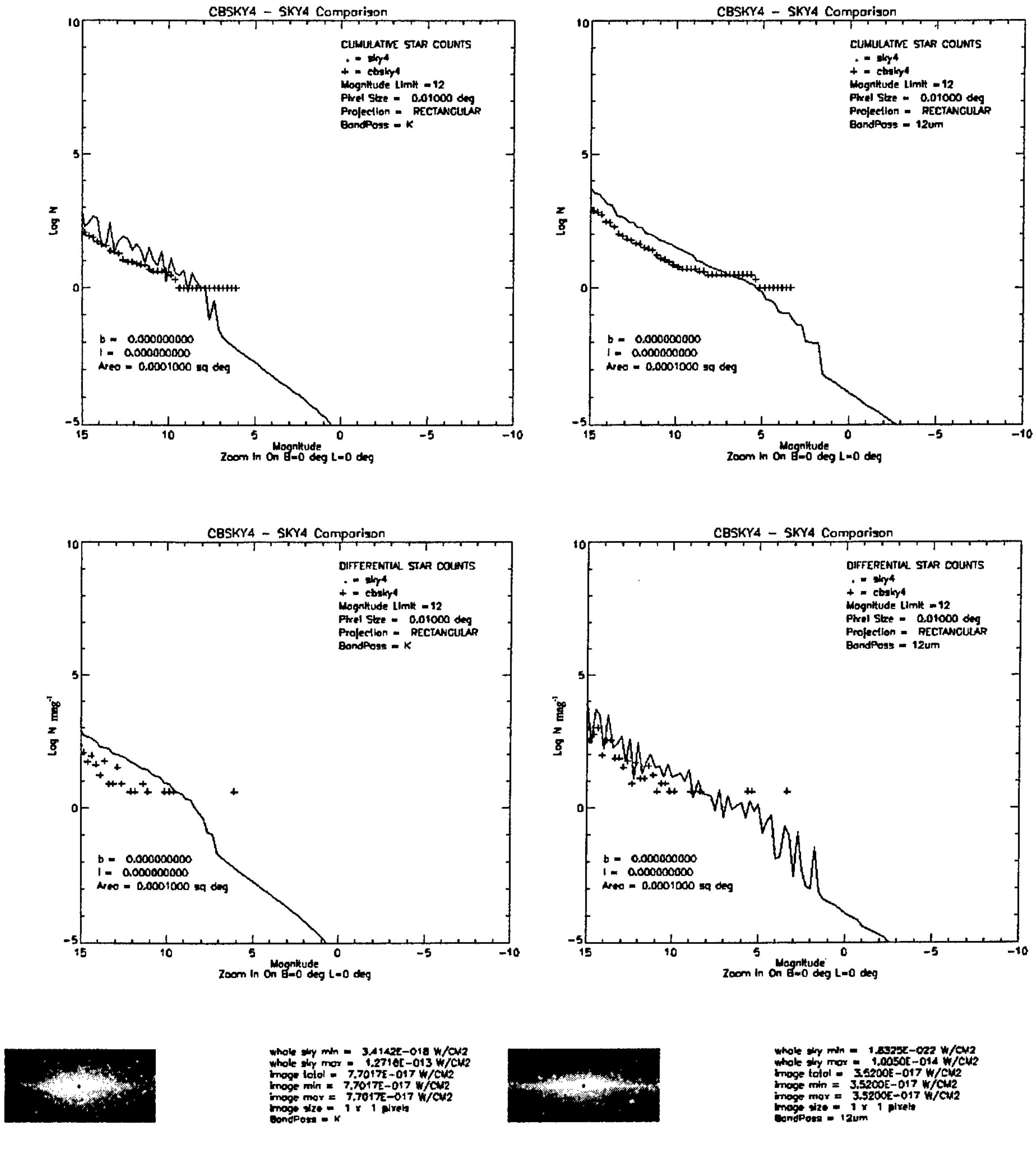


Figure 2: SKY4 - CBSKY4 comparison for l = 0.0, b = 0.0.

At small fields of regard at L=28 and B=0, CBSKY4 provides star counts closely matched to SKY4 as shown in Figure 3.

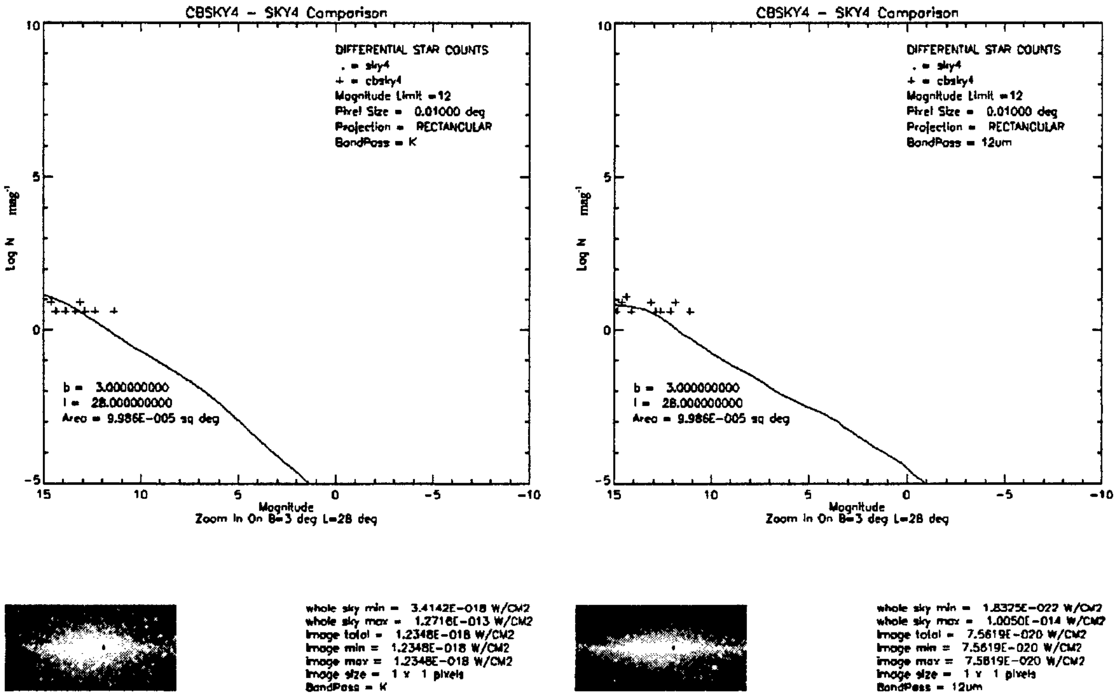


Figure 3: SKY4 - CBSKY4 comparison for l = 28.0, b = 3.0.

4.1.7 Galactic North and South Poles

The CBSKY4 code was tested for its ability to reproduce statistics in stressing regions from very large FOV to very small FOV. The CBSKY4 positional accuracy is 2 arc seconds. At that resolution, most FOV will have stellar densities of less than one star. Each line-of-sight was run for a single pixel with the following angular extents (in degrees): {10, 5, 1, 0.5}. Figure 4 shows the agreement at the Galactic North Pole for a pixel 5 degrees on a side. As the region size decreases, Cohen's SKY4 produces only fractional stars. The area field doesn't display because the center is on the pole (cos(90) = 0). The Galactic North Pole region had no stars in the 0.5 degree field. The K band and 12μm band runs were made for the following central lines-of-sight. All were run using the Galactic coordinate system option. All of the comparison plots are provided in Appendix D.

Table 7: Galactic Poles For Zoom-In

Galactic Latitude [degree]	Galactic Longitude [degree]	Location
90.0	0.0	Galactic North Pole
-90.0	0.0	Galactic South Pole

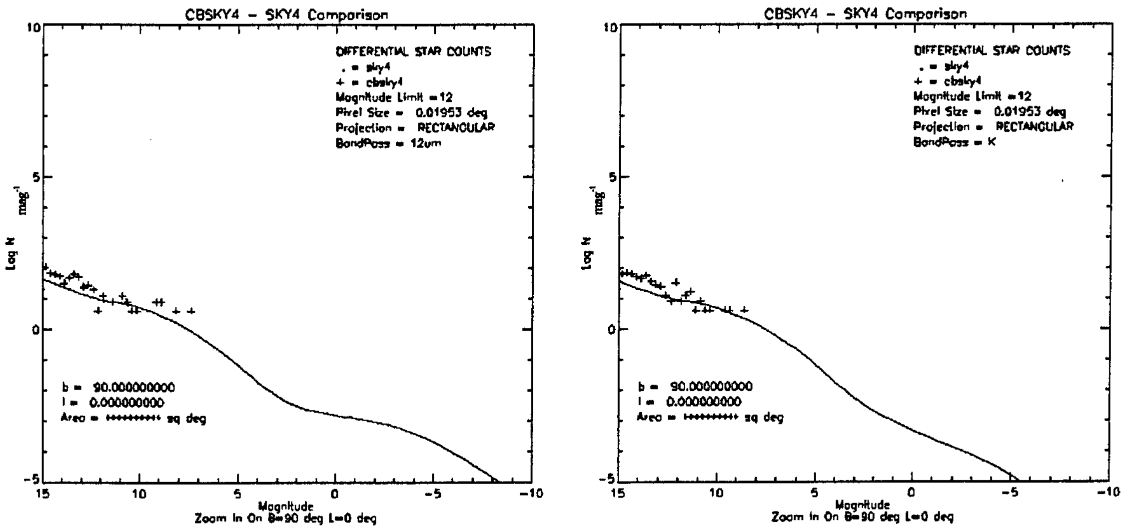


Figure 4: SKY4 - CBSKY4 comparison for l = 0.0, b = 90.0.

4.1.8 LMC/SMC Confused Region

The CBSKY4 code was tested for its ability to reproduce statistics in stressing high star density or confused regions from very large FOV to very small FOV. The K band and 12μm band runs were made for the following central lines-of-sight (Table 7), centered in the Large Magellanic Cloud and the Small Magellanic Cloud. All were run using the Galactic coordinate system option. Figure 5 once again illustrates the excellent agreement between CBSKY4 and SKY4. All of the comparison plots are provided in the Appendix E.

Table 8: Confused Regions for Zoom-In

Galactic Latitude [degree]	Galactic Longitude [degree]	Approx. Location
-32	281	Large Magellanic Cloud
-44	303	Small Magellanic Cloud

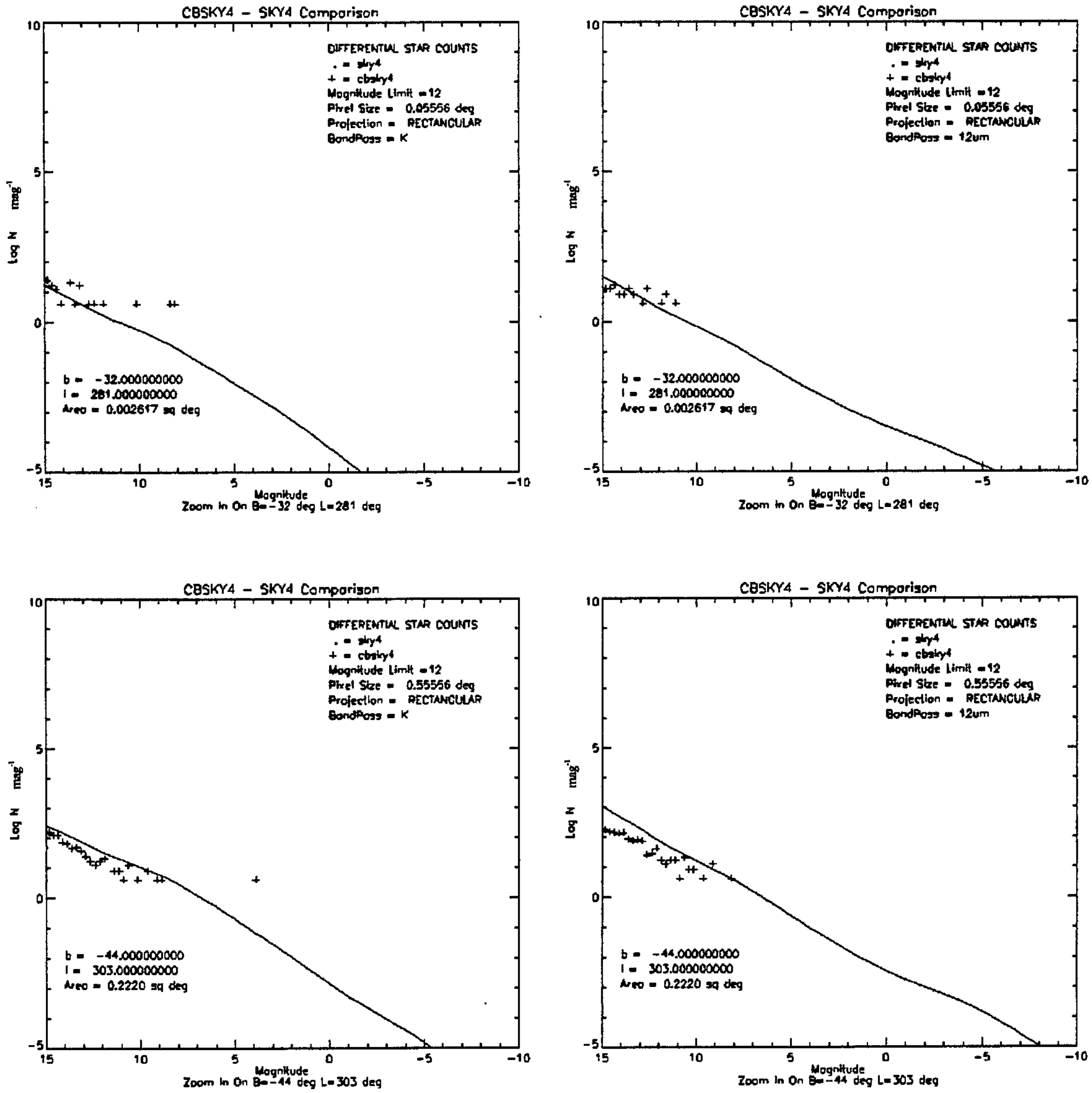


Figure 5: SKY4 - CBSKY4 comparison for l = 303.0, b = -44.0.

4.1.9 Validation Results for Horizontal Slices

The CBSKY4 model was run for large regions in both the K band and the 12 μm band. Here, the whole sky was divided into 18 regions each the full 360 degree longitude extent by 10 degrees of latitude extent. The latitudes were contiguous 10-degree intervals. The code showed excellent agreement with the Cohen SKY4. These plots all showed excellent agreement; however, only two are included in this document (Figures 6 & 7).

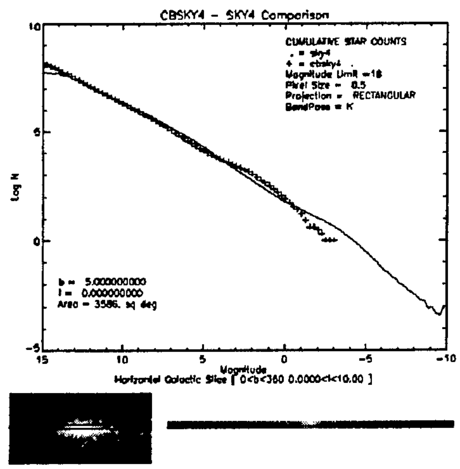


Figure 6: SKY4-CBSKY4 comparison for l= 0.0, b= 5.0.

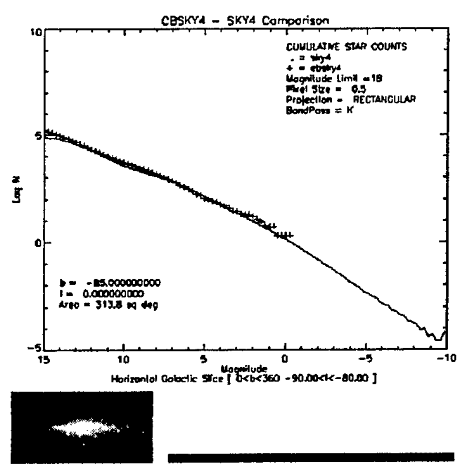


Figure 7: SKY4 - CBSKY4 comparison for l = 0.0, b = -85.0.

4.2 Implementation of Star Catalogs

4.2.1 Validation of Catalog Use

To verify star catalog inputs, we validated that the selected star catalog data was read and interpreted, and that units of flux and position are consistently carried through the program execution for final star placement. For this validation, select regions were analyzed for completeness and accuracy against the star catalogs.

Figure 8 was generated for a model run of the Orion region with 3 different spectral bands. Table 9 lists the output of a catalog with a catalog limit of magnitude 3 for the V spectral band. Orion is famous for its hot, young OB stars (Cohen Type 30). The shaded stars are from the brt_iras.dat file. The other stars are from the brt_bsc5.dat file.

Right Ascension	Declination	Magnitude	Class
68.262278	16.409710	-0.1738654	21
72.424535	14.169373	2.7787196	22
78.029306	-8.256815	-0.8680001	30
82.319068	18.559455	2.4490589	32
83.174611	-5.495305	-1.1767017	1
83.257945	-5.295801	-2.1422117	1
88.114508	7.400883	-1.4928668	32
91.331987	-6.374648	1.1022027	85
92.491647	18.003777	2.7210263	85
92.963563	22.523927	2.8706929	25
94.403635	-10.614598	0.7322221	84
94.982804	22.540709	2.3545027	25
68.262888	16.407713	0.8913612	32
76.346241	-5.150663	2.7909519	5
78.033512	-8.257995	0.1309763	30
80.611888	6.305895	1.6817131	30
82.359820	0.263732	2.2813688	30
83.246491	-5.941264	2.8290252	30
83.418656	-1.232277	1.7396323	30
84.558543	-1.967674	2.0993074	30
86.346074	-9.686005	2.1054589	30
88.116216	7.399391	0.5001933	12
94.984511	22.539618	2.8873885	25

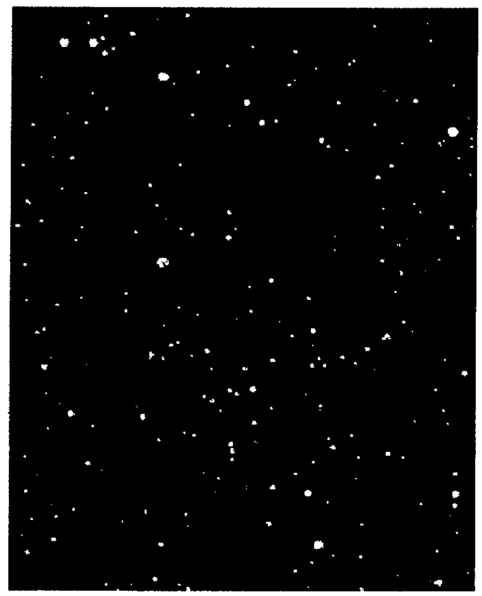


Figure 8: The region around Orion and the CBSKY4 catalog of stars.

Table 9: Finding the first few IRAS stars:

RA(J2000) Deg	Dec(J2000) Deg	Class	Magnitude
68.9794	16.5112	21	-3.48
73.1324	14.2518	22	-1.20

When the first values are precessed to B1950 coordinates (the reference equinox of the input cbsky4.inp file was B1950) the RA/Dec (68.262279, 16.409710) matches the listing values. Thus the output catalog is in the coordinate system with equinox being the user input. Likewise the star listing in the brt_bsc5.dat file: (68.9800 16.5092 32 0.785) when precessed yields: RA/Dec (68.262891, 16.407712). It was also validated that when the reference_frame is set to another equinox, the catalog listing has the RA/Dec values referenced to that equinox.

4.2.2 Finding Stars From Other Catalog Listings

Table 10 was taken from a set of IR spectra found at ftp://adc.gsfc.nasa.gov/pub/adc/archives/catalogs/3/3045/. This data set contains the relative fluxes for 46 spectra (30 stars plus the Sun), ranging in spectral type from A0 to M7. Spectra of seven carbon stars are included. Although some spectra cover the wavenumbers from 2500 to 8200, many spectra do not include wavenumbers less than 4000 and there are many gaps as a result of atmospheric absorption.

The star coordinates are listed, and the results of finding the corresponding catalog stars are presented in the table on the next page. It is not surprising that there are discrepancies between the listings, since the reported values may be truncated, thus not preserving the 2 arcsec accuracy. The greatest deviation was found in Arcturus (alpha Boo). This was not surprising since the NASA spectra were acquired in the late 1960s, and considering the proper motion of Arcturus (2.28 arcsec/year).

Sometimes, there is a corresponding star in both the Yale Bright Star Catalog and the IRAS Catalog. This could result in an over-estimation of brightness because the star might be included twice. Furthermore, the two catalogs do not necessarily assign the star to the same Cohen SKY4 spectral class.

Table 10: CBSKY4 Catalog Stars Corresponding to NASA Archive of IR Spectra Stars (RA / Dec in J2000)

Star Name	NASA's Archive Listing			CBSKY4 IRAS Listing			CBSKY4 Yale Bright Star Listing		
	RA	Dec	Spectral Class	RA	Dec	Cohen Spectral Class	RA	Dec	Cohen Spectral Class
omicron Cet	34.8363	-1.02556	M6 e	34.8345	-2.97410	27 (M5 III)	34.8362	-2.97750	29 (M7 III)
rho Per	46.2917	38.8417	M3 II III	46.2971	38.8446	26 (M4 III)	46.2942	38.8403	33 (M3-4 I-II)
alpha Tau (Aldebaran)	68.9792	16.5119	K5 III	68.9794	16.5112	21 (K4,5 III)	68.9800	16.5092	32 (K-M2 I-II)
W Ori	76.3483	1.17750	C 5,3	76.3459	1.17980	47 (AGB C 01)			
alpha Ori (Betelguese)	88.7925	7.40694	M1-2 IAB	88.7912	7.40840	32 (K-M2 I-II)	88.7929	7.40690	12 (M0-1 V)
eta Gem	93.7204	22.5069	M3 III	93.7193	22.5077	25 (M3 III)	93.7192	22.5067	25 (M3 III)
mu Gem	95.7392	22.5150	M3 III	95.7383	22.5147	25 (M3 III)	95.7400	22.5136	25 (M3 III)
UU Aur	99.1367	38.4456	C 5,3	99.1390	38.4455	48 (AGB C 03)			
alpha CMa (Sirius)	101.295	-15.3006	A1 V	101.285	-16.7112	4 (B8-A0 V)	101.287	-16.7161	5 (A2-5 V)
VY CMa	110.743	-24.2325	C M3-5 e Ia-Iab	110.744	-25.7688	39 (AGB M 11)			
X Cnc	133.845	17.2311	C 5,4	133.847	17.2299	47 (AGB C 01)			
R Leo	146.889	11.4294	M8 e	146.889	11.4280	29 (M7 III)	146.890	11.4289	29 (M7 III)
U Hya	159.387	-12.6161	C 7,3	159.378	-13.3834	48 (AGB C 03)	159.388	-13.3844	33 (M3-4 I-II)
Y CVn	191.283	45.4400	C 5,4	191.282	45.4369	47 (AGB C 01)			
R Hya	202.429	-22.7186	M7 e	202.428	-23.2849	29 (M7 III)	202.428	-23.2814	29 (M7 III)
alpha Boo (Arcturus)	213.931	19.2103	K2 III p	213.919	19.1895	20 (K2,3 III)			
delta Oph	243.587	-2.30778	M0.5 III	243.585	-3.69590	23 (M1 III)	243.586	-3.69440	22 (M0 III)
alpha Sco (Antares)	247.352	-25.5683	M2 Ia	247.343	-26.4333	32 (K-M2 I-II)	247.352	-26.4319	23 (M1 III)
alpha Her	258.662	14.3897	M5 IB-II	258.660	14.3880	27 (M5 III)	258.662	14.3903	33 (M3-4 I-II)
gamma Dra	269.151	51.4892	K5 III	269.147	51.4865	21 (K4,5 III)	269.152	51.4889	21 (K4,5 III)
T Lyr	278.083	36.9989	C 6,5	278.081	36.9970	48 (AGB C 03)			
alpha Lyr (Vega)	279.231	38.7797	A0 V	279.230	38.7801	4 (B8-A0 V)	279.235	38.7836	5 (A2-5 V)
delta2 Lyr	283.626	36.8986	M4 II	283.623	36.8969	26 (M4 III)	283.626	36.8989	33 (M3-4 I-II)
R Lyr	283.833	43.9450	M5 III	283.826	43.9437	27 (M5 III)	283.834	43.9461	27 (M5 III)
chi Cyg	297.641	32.9147	M p,e, s	297.639	32.9133	29 (M7 III)			
EU Del	309.477	18.2675	M6 III	309.478	18.2676	28 (M6 III)	309.478	18.2692	28 (M6 III)
mu Cep	325.876	58.7800	M2 Ia	325.874	58.7805	32 (K-M2 I-II)	325.877	58.7800	32 (K-M2 I-II)
beta Peg	345.940	28.0808	M2-3 II-III	345.939	28.0833	33 (M3-4 I-II)	345.944	28.0828	24 (M2 III)
19 Psc	356.598	3.48722	C 6,2	356.598	3.48980	47 (AGB C 01)			
R Cas	359.601	51.3883	M7 e	359.602	51.3916	29 (M7 III)	359.603	51.3886	29 (M7 III)

4.2.3 Catalog Synthesis with Statistical Stars

We also validated that when CBSKY4 synthesizes star catalog data and SKY4 statistical stars, the statistical distributions of bright stars were not skewed. The real stars are added to the statistical stars. No changes are made to the SKY4 log(N) vs. magnitude statistics prior to including statistical stars in the image and output. The Orion image of Section 4.2.2 was run for the K band for real stars only, statistical stars, only, and the synthesis of real and statistical stars. Table 11 shows that the number of real stars is a very small fraction of the statistical star count. The Log(N) vs. Log(S) plots of Figure 9 show no significant changes to the statistics when catalog stars are included.

Table 11: Star Counts for Options of Statistical and Real Stars

Real Stars Only	Statistical Stars Only	Real and Statistical Stars
526	5,190,557	5,191,083

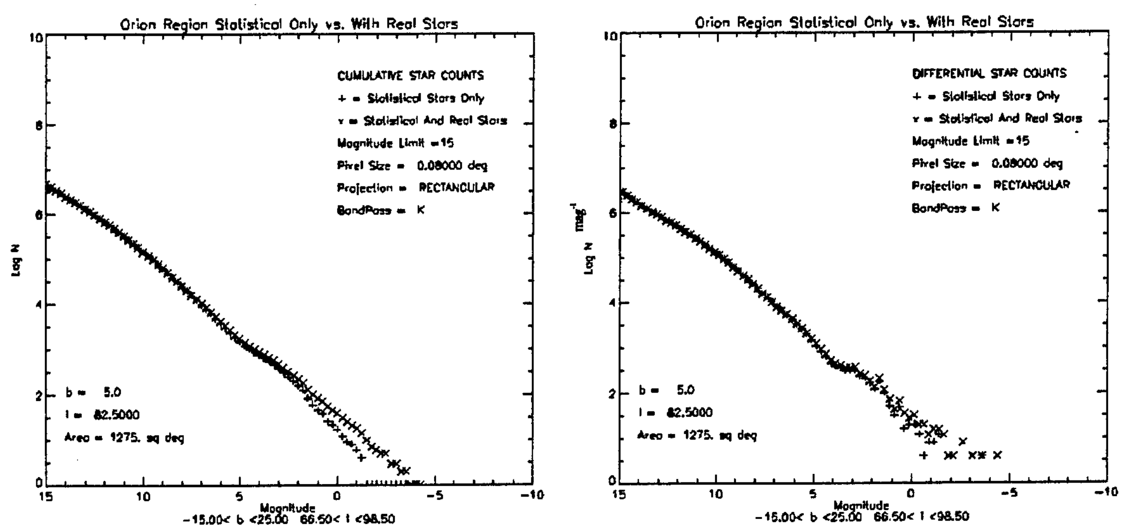


Figure 9: Log(N) vs. Log(S) Plots Show No Skewing with Inclusion of Catalog Stars

4.3 Predictive Positional Validation

4.3.1 Different Projections

The code was run centered on one star for the various map projections, etc., and appears to be inserting the star in the correct pixel. The positional accuracy of the output image depends on the pixel resolution.

4.3.2 Convolution Applied

When a convolution is applied, the star is convolved into the image with its position at the center of the pixel that its coordinate falls into, thus some positional accuracy is lost in the convolution process. The accuracy depends on the user's definition of the pixel size.

4.4 Predictive Flux Validation

4.4.1 Flux of Arcturus In Different Bands

Arcturus is included in the IRAS catalog at RA=213.918500 degrees, Dec=19.189500 degrees (J2000). The reported 12 μm apparent magnitude is -3.6197126. IRAS lists Arcturus as a Cohen spectral class 20, (K2,3 III). The pixel size for the simulation is 0.00027 degrees on a side. The values are consistent with the

$$F = F_0 \cdot 10^{-m/2.5}$$

formula, given the CBSKY4 pre-defined flux at magnitude zero values (Table 12). Thus it appears that the flux computation in different bands is valid (assuming that the conversion from 12 μm magnitude to the in-band magnitude is correct).

Table 12: CBSKY4 Flux Values for Arcturus: Run for different output spectral band options.

Band	Code Output Flux [W/CM2/MICRON]	Code Output Flux [W/CM2]	Code Output Magnitude	CBSKY4 F_0 (W/m^2)
B	5.25431e-012	5.14923e-013	0.247906	6.47E-09
V	9.40025e-012	8.36623e-013	-0.984032	3.38E-09
J	2.58173e-012	9.81059e-013	-2.72832	7.95E-10
H	2.77867e-012	8.33600e-013	-3.37896	3.71E-10
K	8.23927e-013	3.95485e-013	-3.48933	1.59E-10
2.4UM	6.23605e-013	5.61245e-014	-3.36938	2.52E-11
12UM	2.21931e-015	1.55352e-014	-3.61971	5.539E-12
25UM	1.30369e-016	1.45362e-015	-3.67997	4.903E-13
1565A		simulation failed		1.118E-9
1400A		simulation failed		2.44E-9
1660A		simulation failed		1.044E-9

4.4.2 12 μm Flux of Arcturus In Different Units

Arcturus is included in the IRAS catalog at RA=213.918500 degrees, Dec=19.189500 degrees (J2000). The reported 12μm apparent magnitude is -3.6197126. IRAS lists Arcturus as a Cohen spectral class 20, (K2,3 III). The pixel size for the simulation is 0.00027 degrees on a side. Table 13 gives values of the CBSKY4 output for Arcturus in various units. Table 14 provides the formulas used to convert between the various units.

Table 13: CBSKY4 12μm Flux Values for Arcturus run for different output unit options.

cbsky.inp Units Parameter Value	12 μm Flux
W/CM2	1.55352e-014
W/CM2/MICRON	2.21931e-015
JY	25.9444
W/CM2/SR	0.000699575
W/CM2/MICRON/SR	9.99393e-005

Table 14: Formulas for Conversion between Units (Using W/cm² as Reference)

Units	Radiance	Conversion factor from W/cm² to this unit
W/cm²/sr/μm	Average Spectral Radiance	$(pixels/radian)^2 / (\lambda_{max}-\lambda_{min})$
W/cm²/sr	In-band Radiance.	$(pixels/radian)^2$
JY/SR	Jansky per steradian.	$(pixels/radian)^2 / (\lambda_{max}-\lambda_{min}) / (Fluxj)$
W/cm²	In-band Astronomical Radiance or Flux (differs by a factor of π from other definitions of radiosity.)	1
W/cm²/μm	Average Astronomical Spectral Radiance	$1 / (\lambda_{max}-\lambda_{min})$
JY	Jansky	$1 / (\lambda_{max}-\lambda_{min}) / (Fluxj)$

For this simulation the following values:

$(pixels/radian)^2 = (180.0 / \pi \cdot 0.00027)^2 = 45031637174.37234286394642809321 2 / rad$

$(\lambda_{max}-\lambda_{min}) = 7$ microns

(Fluxj) = The 12μm flux at magnitude zero is 5.539E-12 W/m².

are used to find the conversion factors. The implemented units appear to have been implemented properly.

4.4.3 User-Defined Flux at Magnitude Zero

The flux at magnitude zero feature does not appear to have been implemented to override the flux at magnitude zero of the pre-defined bands or the computed value for user-defined bands.

4.4.4 Convolution Applied

To check out the convolution algorithm, the code was run for a very small region centered on Arcturus with the K band. Table 15 lists the key parameters and their values while Table 16 gives the results for different convolution filter sizes.

Table 15: CBSKY4 Parameters Used for Testing the Convolution Routine

Key Parameter	Value
image_projection	Rectangular
x_column_pixels	21
y_row_pixels	21
pixel_size	.00027
image_center_longitude_degrees	213.919
image_center_latitude	19.1895
units	W/CM2
Reference_Frame	J2000
coordinate_system	equatorial
positions	apparent
Reference_system	geocentric
start_wavelength	K

These values were run for no convolution, Gaussian convolution, and circular convolution, for a set of point-spread-function half widths, and the image statistics were tabulated. The total radiance is preserved. Spatially, the Gaussian convolution looks like a Gaussian convolution. The circular convolution has a square shape, and appears like the negative of what might be expected from a circular convolution. There probably are not many applications that would use the circular convolution option, and it has artifacts of square shape and sharp edges.

Table 16: CBSKY4 Output Shows Convolution Preserves Total Radiance

Convolution	PSF Half Width [pixels]	Maximum Image Value [W/cm2]	Total Image Value [W/cm2]	Output Catalog Radiance	Scaled Image
no convolution	n/a	3.95485e-013	3.95485e-013	3.9550000e-009	
Gaussian	1.100	1.04036e-013	3.95485e-013	3.9550000e-009	
Gaussian	1.200	8.74211e-014	3.95485e-013	3.9550000e-009	
Gaussian	1.300	7.44892e-014	3.95485e-013	3.9550000e-009	
Gaussian	1.400	6.42279e-014	3.95485e-013	3.9550000e-009	
Gaussian	1.500	5.59497e-014	3.95485e-013	3.9550000e-009	
Gaussian	1.600	4.91745e-014	3.95485e-013	3.9550000e-009	
Gaussian	1.700	4.35594e-014	3.95485e-013	3.9550000e-009	
Gaussian	1.800	3.88539e-014	3.95485e-013	3.9550000e-009	
Gaussian	1.900	3.48717e-014	3.95485e-013	3.9550000e-009	
Gaussian	2.000	3.14717e-014	3.95485e-013	3.9550000e-009	
Gaussian	2.100	2.85457e-014	3.95485e-013	3.9550000e-009	
Gaussian	2.200	2.60096e-014	3.95484e-013	3.9550000e-009	
circular	1.100	1.99339e-014	3.95485e-013	3.9550000e-009	
circular	1.200	1.29097e-014	3.95485e-013	3.9550000e-009	
circular	1.300	1.29097e-014	3.95485e-013	3.9550000e-009	
circular	1.400	1.12984e-014	3.95485e-013	3.9550000e-009	
circular	1.500	8.06600e-015	3.95485e-013	3.9550000e-009	
circular	1.600	8.06600e-015	3.95485e-013	3.9550000e-009	
circular	1.700	7.25787e-015	3.95485e-013	3.9550000e-009	
circular	1.800	7.25787e-015	3.95485e-013	3.9550000e-009	
circular	1.900	5.51151e-015	3.95485e-013	3.9550000e-009	
circular	2.000	5.05068e-015	3.95485e-013	3.9550000e-009	
circular	2.100	5.05069e-015	3.95485e-013	3.9550000e-009	
circular	2.200	4.00249e-015	3.95485e-013	3.9550000e-009	

Figure 10 provides surface plots of the convolved Arcturus for the different convolutions.

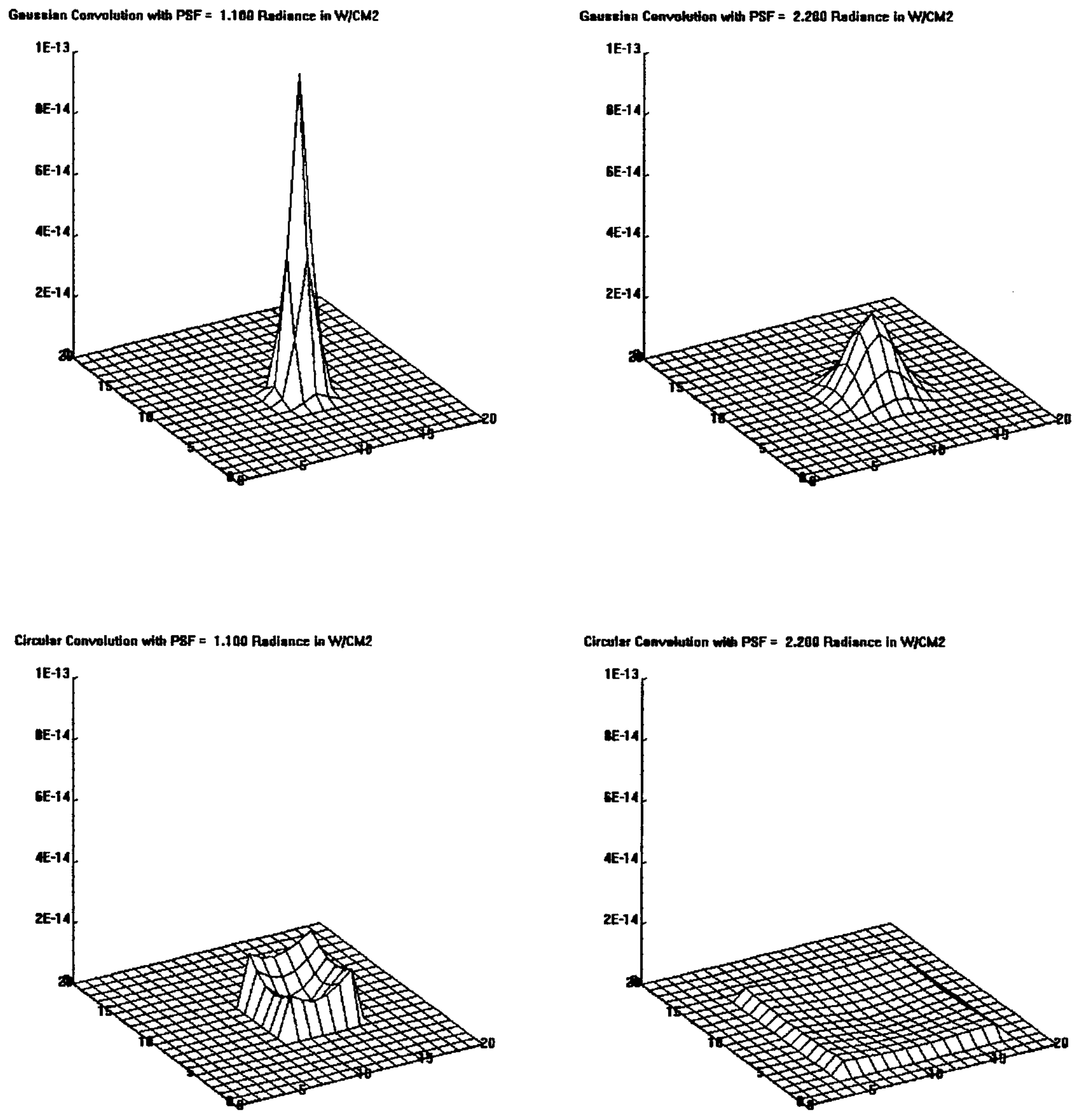


Figure 10: Convolution filter results for Arcturus.

4.4.5 Comparison To Measured Spectra

The Arcturus example was run for a series of contiguous user-defined bands, each 0.2 μm in width, from 2 μm to 6 μm. The radiance values of Arcturus in the output images were plotted as a spectrum. This spectrum is compared with the corresponding Cohen Spectral Class 20 spectrum, converted from the CBSKY4 distribution file library.dat to W/cm2/μm. In the IRAS bright star catalog, Arcturus is assigned to Class 20, the K2,3 III stars.

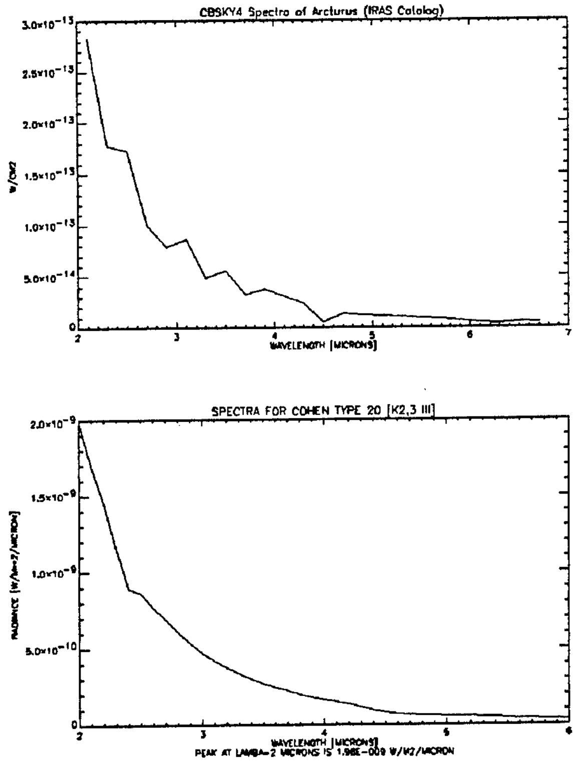


Figure 11 Spectra of Arcturus, from the IRAS catalog (top), the spectrum of a stellar type 20 star (bottom).

Finally, these spectra are compared to a measured spectra of Arcturus (units are not reported) acquired at ftp://adc.gsfc.nasa.gov/pub/adc/archives/catalogs/3/3045/. This spectra is reported to be of Alpha Bootis, a K2 III p star, taken on March 14, 1968, and covering wavenumbers 3900-8200 cm^{-1}. For comparison, the values were converted to units per micron, and only the 2 to 6 μm portions plotted in Figure 12.

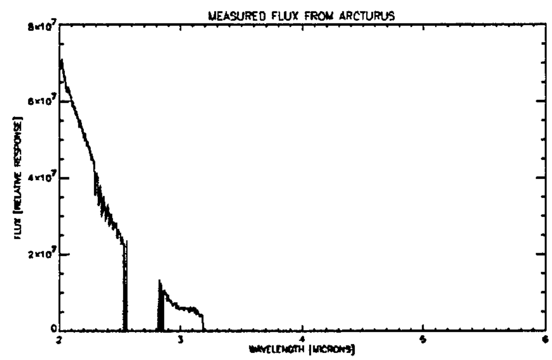


Figure 12: Measure spectra of Arcturus from NASA archive.

4.5 Code Operation Validation

The code operation performs according to descriptions provided in the user's manual. One idiosyncrasy is that even when statistical stars are turned off, the code still produces a 0 length .sta (Log(N) vs. Log(S)) file; however, this has no impact on the user. This will be corrected in future updates of the model.

4.6 Acceptance Regression Validation

A set of test cases has been adopted for code validation through code changes. This test set may be revised however due to code changes. These test cases are provided with the model.

4.7 Documentation Validation

The code performs according to the descriptions provided in the user's manual.

5. Summary

When applied within the limitations noted in Section 2.6 of this report, the CBSKY4 model has been shown to produce high fidelity physics-based, celestial background simulations with the accuracy required to support the development of NMD electro-optic sensors/systems.

This validation is based on comparisons of the CBSKY4 model using the following benchmarks:

- The Cohen SKY4 Model
- The Yale Bright Star Catalog
- IRAS & MSX Bright Infrared Stars

CBSKY4 thus represents the state-of-the-art with regard to modeling the impact of celestial backgrounds on the operation of NMD target detection systems. CBSKY4 can be used with confidence to meet the accuracy and speed requirements for backgrounds modeling in support of NMD system simulations.

References

Cohen, M. (1993). "A Model of the 2-35 μm Point Source Infrared Sky," *Astron. J.*, **105**, 1860.

Cohen, M. (1994a). "Powerful Model for the Point Source Sky: Far-Ultraviolet and Enhanced Midrange Performance," *Astron. J.*, **107**, 1993.

Fraknoi, Morrison, and Wolff (2000). *Voyages Through the Universe*, Saunders College Publishing.

Gray, David (1976). *The Observations and Analysis of Stellar Photosphere*, Wiley.

Hoffleit, Dorrit (1964). *Catalog of Bright Stars*, Yale University Observatory.

Mihalas, D. (1978). *Stellar Atmospheres*, W. H. Freeman and Company.

Piccolomini, Alessandro (1540). *On the Fixed Stars*, Venice.

Sillion, Francois and Claude Puech (1994). *Radiosity and Global Illumination*, Morgan Kaufmann.

Unsöld, A. and B. Baschek, (1991). *The New Cosmos*, Springer-Verlag.

Web Sites with Data

ftp://adc.gsfc.nasa.gov/pub/adc/archives/catalogs/3/3045/.

http://www.krysstal.com/brightest.html

Web Sites with Historical Astronomy Information

http://www.lhl.lib.mo.us/pubserv/hos/stars/pto.htm

http://www.phys-astro.sonoma.edu/BruceMedalists/BM2H-L.html

http://www.phys-astro.sonoma.edu/BruceMedalists/BM2O-P.html

http://www.mtwilson.edu/Education/History/cal88/cal1188.html

http://www.mtwilson.edu/Education/History/cal89/cal1189.html

http://www.mtwilson.edu/Education/History/cal90/cal1090.html

Appendix A

Appendix A lists cases from the Cohen, May 1993 Astronomical Journal for 12μm and K band.

Tables A.1 and A.2 give the inputs for the SKY4 and CBSKY4 models respectively and Figure A.1 gives the resultant output for l = 0.08, b = 0.02.

Tables A.3 and A.4 give the inputs for the SKY4 and CBSKY4 models respectively and Figure A.2 gives the resultant output for l = 19.93, b = 0.46.

Tables A.5 and A.6 give the inputs for the SKY4 and CBSKY4 models respectively and Figure A.3 gives the resultant output for l = 10.42 b = 0.13.

Tables A.7 and A.8 give the inputs for the SKY4 and CBSKY4 models respectively and Figure A.4 gives the resultant output for l = 29.26, b = 0.08.

Tables A.9 and A.10 give the inputs for the SKY4 and CBSKY4 models respectively and Figure A.5 gives the resultant output for l = 39.96, b = 0.07.

Tables A.11 and A.12 give the inputs for the SKY4 and CBSKY4 models respectively and Figure A.6 gives the resultant output for l = 59.70, b = 0.09.

Tables A.13 and A.14 give the inputs for the SKY4 and CBSKY4 models respectively and Figure A.7 gives the resultant output for l = 49.68, b = 0.16.

Table A.1: Interactive inputs used for the SKY4 runs for l = 0.08, b = 0.02.

Value Used	Description
y	Keep solar displacement of 15 pc N of plane.
n	Integrate over area? No, model 1 square degree.
0.0200	Center galactic latitude in degrees.
0.0800	Center galactic longitude in degrees.
n	No, don't print bright magnitudes-by-components information.
n	No, don't print surface brightness data.
n	No, don't bring back colors.
y	Yes, create LogN vs. LogS plots.
5 and 7	Use the pre-defined "12UM" bandpass (value=7) and use the pre-defined "K" bandpass (value=5) [Two separate sky4 runs.]
y and n	y = plot cumulative LogN on the y-axis; n = plot differential LogN on the y-axis [Two separate sky4 runs.]
y	Plot Magnitudes on x-axis.
n	No, don't plot observed points.

Table A.2: CBSKY4 Inputs for l = 0.08, b = 0.02.

[Path] architecture = DOS path=\cbsd4\dataout\cbsky4\AJ_May1993_ 12um\ code_path=\cbsd4\cbsd\cbsky4 data_path=\cbsd4\cbsd\sky4data verbose = YES [cbsky4] log_output = Case_2.log map = NO real_stars = NO statistical_stars = YES clouds = YES magnitude_limit = 12 seed = 346 method = catalog = NO catalog_limit = 10 nodesfile = NODE_IAH.DAT elementsfile = ELEM_IAH.DAT extinction = YES count_statistics = YES x-axis = MAGNITUDES y-axis = Differential errmap = NO extmap = NO spectral_type = 0 [convolution] convolution = NO point_spread_function = gaussian psf_half_width = 1.01	[Image] Image = YES output_format = FITS image_type=4-BYTE REAL image_projection = RECTANGULAR x_column_pixels = 256 y_row_pixels = 256 pixel_size = 0.0039062500000 image_center_longitude_degrees = 0.080000000 image_center_latitude = 0.020000000 units = W/CM2 [Positional] observer_altitude = 0.0 observer_geographic_latitude = 0.0 observer_geographic_longitude = 0.0 Reference_Frame = B1950 coordinate_system = galactic positions = apparent Reference_system = geocentric [spectral] start_wavelength =12um end_wavelength=12um [Time] observation_date=2 2 2000 observation_time=0 0 0.0

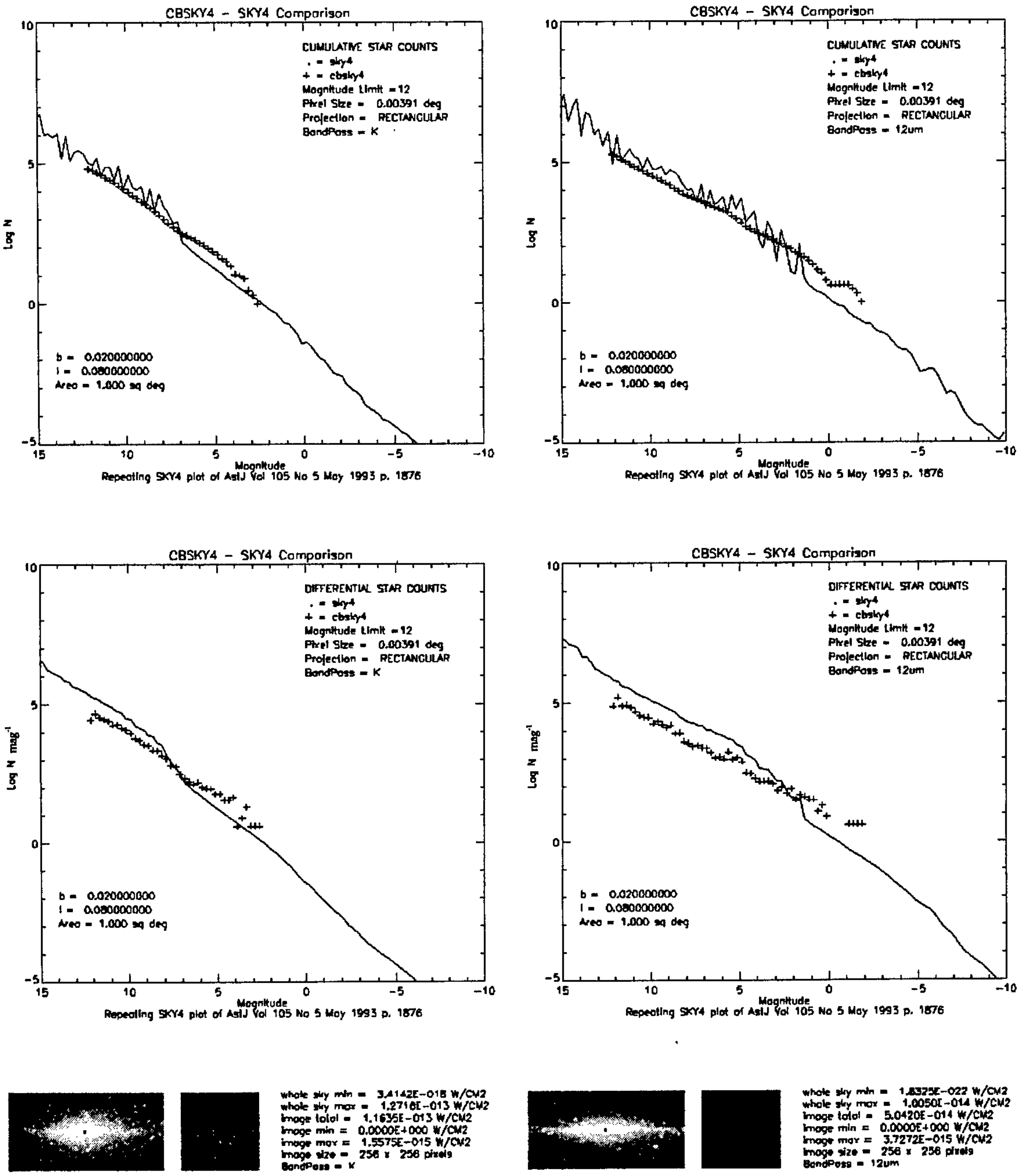


Figure A.1: SKY4 - CBSKY4 comparison for l = 0.08, b = 0.02.

Table A.3: Interactive inputs used for the SKY4 runs for l = 19.93, b = 0.46.

Value Used	Description
y	Keep solar displacement of 15 pc N of plane.
n	Integrate over area? No, model 1 square degree.
0.4600	Center galactic latitude in degrees.
19.9300	Center galactic longitude in degrees.
n	No, don't print bright magnitudes-by-components information.
n	No, don't print surface brightness data.
n	No, don't bring back colors.
y	Yes, create LogN vs. LogS plots.
5 and 7	Use the pre-defined "12UM" bandpass (value=7) and use the pre-defined "K" bandpass (value=5) [Two separate sky4 runs.]
y and n	y = plot cumulative LogN on the y-axis; n = plot differential LogN on the y-axis [Two separate sky4 runs.]
y	Plot Magnitudes on x-axis.
n	No, don't plot observed points.

Table A.4: CBSKY4 Inputs for l = 19.93, b = 0.46.

[Path] architecture = DOS path=\cbsd4\dataout\cbsky4\AJ_May1993_ 12um\ code_path=\cbsd4\cbsd\cbsky4 data_path=\cbsd4\cbsd\sky4data verbose = YES [cbsky4] log_output = Case_3.log map = NO real_stars = NO statistical_stars = YES clouds = YES magnitude_limit = 12 seed = 346 method = catalog = NO catalog_limit = 10 nodesfile = NODE_IAH.DAT elementsfile = ELEM_IAH.DAT extinction = YES count_statistics = YES x-axis = MAGNITUDES y-axis = Differential errmap = NO extmap = NO spectral_type = 0 [convolution] convolution = NO point_spread_function = gaussian psf_half_width = 1.01	[Image] Image = YES output_format = FITS image_type=4-BYTE REAL image_projection = RECTANGULAR x_column_pixels = 256 y_row_pixels = 256 pixel_size = 0.0039062500000 image_center_longitude_degrees = 19.930000000 image_center_latitude = 0.460000000 units = W/CM2 [Positional] observer_altitude = 0.0 observer_geographic_latitude = 0.0 observer_geographic_longitude = 0.0 Reference_Frame = B1950 coordinate_system = galactic positions = apparent Reference_system = geocentric [spectral] start_wavelength =12um end_wavelength=12um [Time] observation_date=2 2 2000 observation_time=0 0 0.0

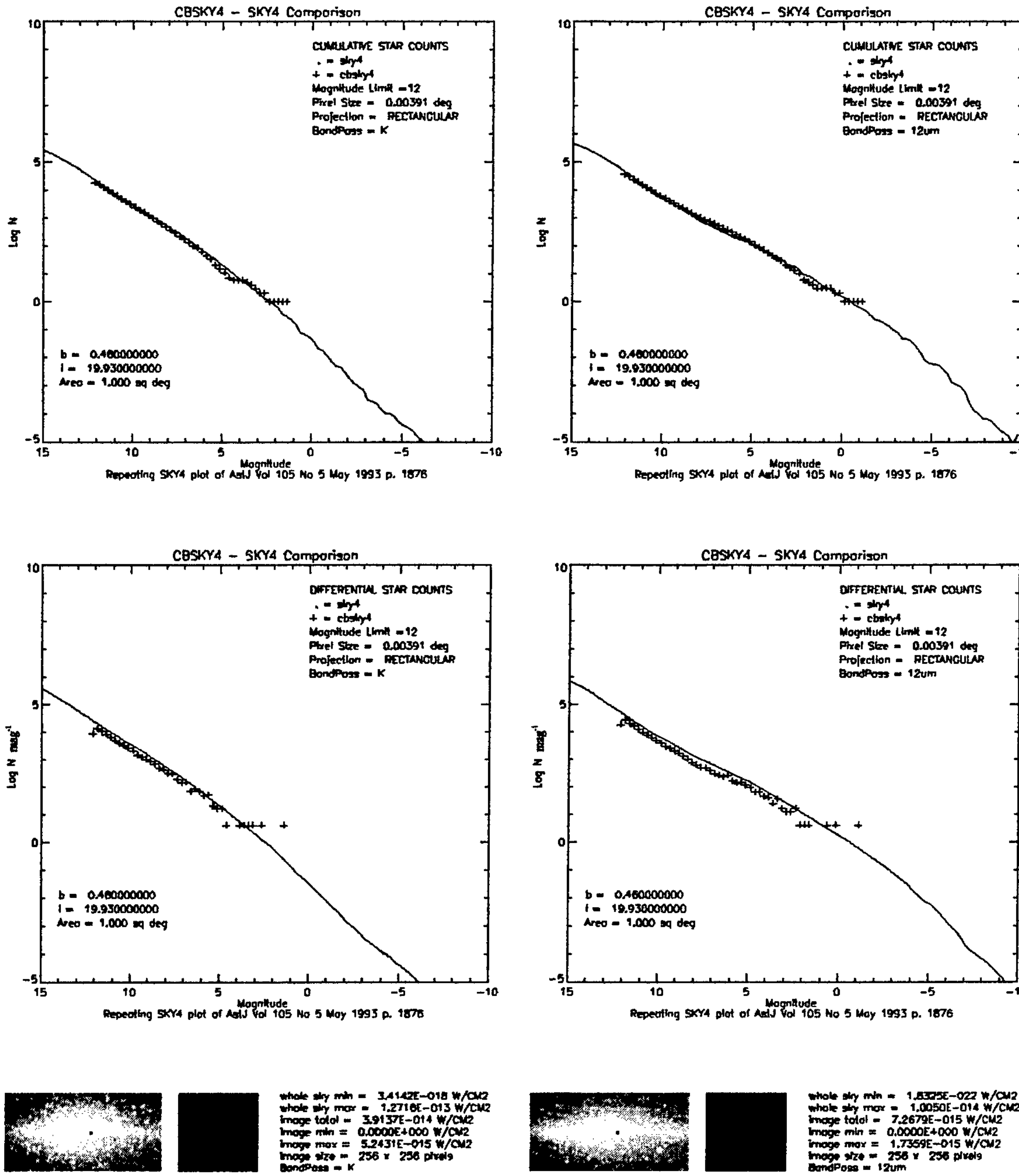


Figure A.2: SKY4 - CBSKY4 comparison for l = 19.93, b = 0.46.

Table A.5: Interactive inputs used for the SKY4 runs for l = 10.42, b = 0.13.

Value Used	Description
y	Keep solar displacement of 15 pc N of plane.
n	Integrate over area? No, model 1 square degree.
0.1300	Center galactic latitude in degrees.
10.4200	Center galactic longitude in degrees.
n	No, don't print bright magnitudes-by-components information.
n	No, don't print surface brightness data.
n	No, don't bring back colors.
y	Yes, create LogN vs. LogS plots.
5 and 7	Use the pre-defined "12UM" bandpass (value=7) and use the pre-defined "K" bandpass (value=5) [Two separate sky4 runs.]
y and n	y = plot cumulative LogN on the y-axis; n = plot differential LogN on the y-axis [Two separate sky4 runs.]
y	Plot Magnitudes on x-axis.
n	No, don't plot observed points.

Table A.6: CBSKY4 Inputs for l = 10.42, b = 0.13.

[Path] architecture = DOS path=\cbsd4\dataout\cbsky4\AJ_May1993_12um\ code_path=\cbsd4\cbsd\cbsky4 data_path=\cbsd4\cbsd\sky4data verbose = YES [cbsky4] log_output = Case_4.log map = NO real_stars = NO statistical_stars = YES clouds = YES magnitude_limit = 12 seed = 346 method = catalog = NO catalog_limit = 10 nodesfile = NODE_IAH.DAT elementsfile = ELEM_IAH.DAT extinction = YES count_statistics = YES x-axis = MAGNITUDES y-axis = Differential errmap = NO extmap = NO spectral_type = 0 [convolution] convolution = NO point_spread_function = gaussian psf_half_width = 1.01	[Image] Image = YES output_format = FITS image_type=4-BYTE REAL image_projection = RECTANGULAR x_column_pixels = 256 y_row_pixels = 256 pixel_size = 0.0039062500000 image_center_longitude_degrees = 10.420000000 image_center_latitude = 0.130000000 units = W/CM2 [Positional] observer_altitude = 0.0 observer_geographic_latitude = 0.0 observer_geographic_longitude = 0.0 Reference_Frame = B1950 coordinate_system = galactic positions = apparent Reference_system = geocentric [spectral] start_wavelength =12um end_wavelength=12um [Time] observation_date=2 2 2000 observation_time=0 0 0.0

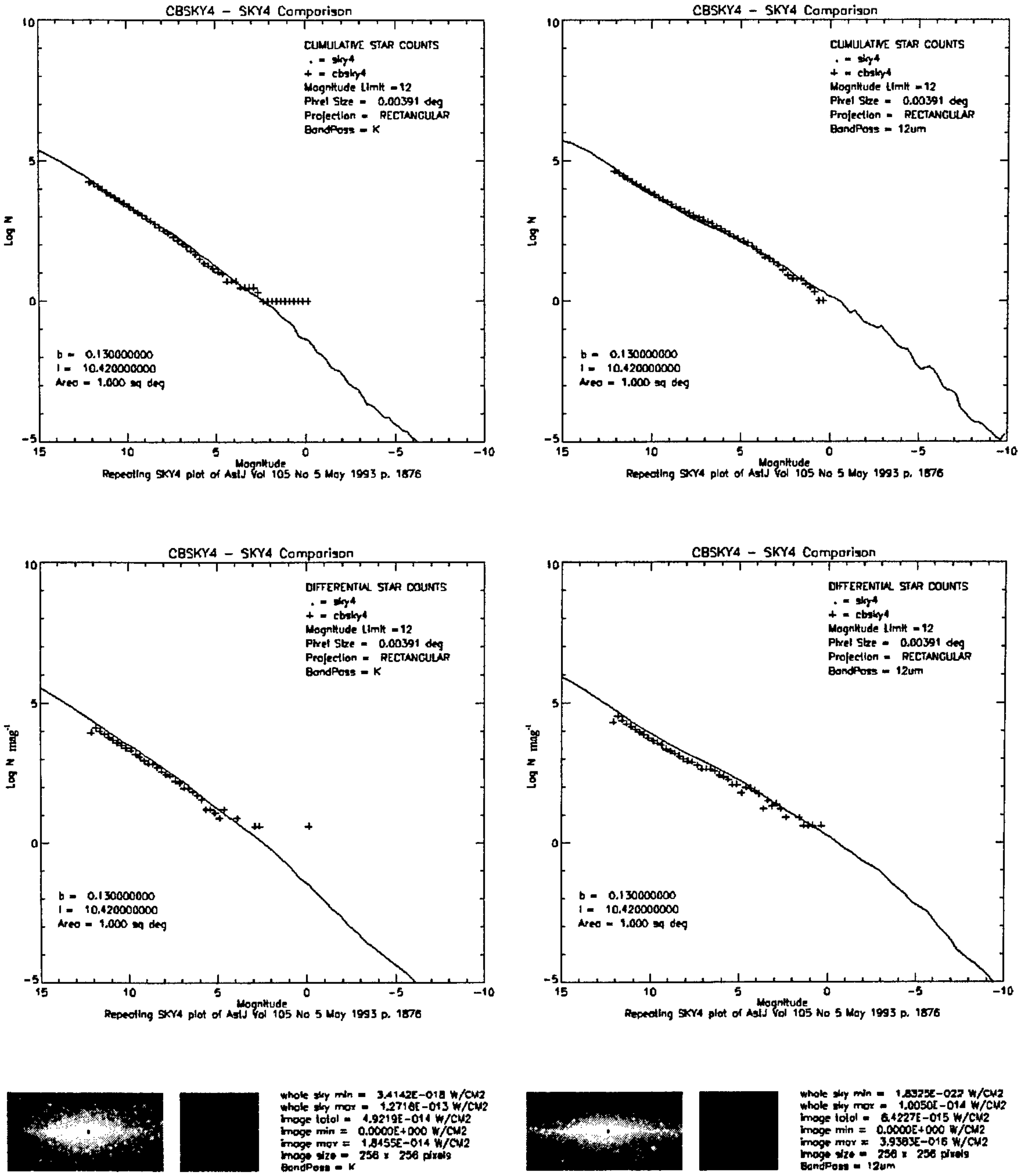


Figure A.3: SKY4 - CBSKY4 comparison for l = 10.42, b = 0.13.

Table A.7: Interactive inputs used for the SKY4 runs for l = 29.26, b = 0.08.

Value Used	Description
y	Keep solar displacement of 15 pc N of plane.
n	Integrate over area? No, model 1 square degree.
0.0800	Center galactic latitude in degrees.
29.2600	Center galactic longitude in degrees.
n	No, don't print bright magnitudes-by-components information.
n	No, don't print surface brightness data.
n	No, don't bring back colors.
y	Yes, create LogN vs. LogS plots.
5 and 7	Use the pre-defined "12UM" bandpass (value=7) and use the pre-defined "K" bandpass (value=5) [Two separate sky4 runs.]
y and n	y = plot cumulative LogN on the y-axis; n = plot differential LogN on the y-axis [Two separate sky4 runs.]
y	Plot Magnitudes on x-axis.
n	No, don't plot observed points.

Table A.8: CBSKY4 Inputs for l = 29.26, b = 0.08.

[Path] architecture = DOS path=\cbsd4\dataout\cbsky4\AJ_May19 93_12um\ code_path=\cbsd4\cbsd\cbsky4 data_path=\cbsd4\cbsd\sky4data verbose = YES [cbsky4] log_output = Case_5.log map = NO real_stars = NO statistical_stars = YES clouds = YES magnitude_limit = 12 seed = 346 method = catalog = NO catalog_limit = 10 nodesfile = NODE_IAH.DAT elementsfile = ELEM_IAH.DAT extinction = YES count_statistics = YES x-axis = MAGNITUDES y-axis = Differential errmap = NO extmap = NO spectral_type = 0 [convolution] convolution = NO point_spread_function = gaussian psf_half_width = 1.01	[Image] Image = YES output_format = FITS image_type=4-BYTE REAL image_projection = RECTANGULAR x_column_pixels = 256 y_row_pixels = 256 pixel_size = 0.0039062500000 image_center_longitude_degrees = 29.260000000 image_center_latitude = 0.080000000 units = W/CM2 [Positional] observer_altitude = 0.0 observer_geographic_latitude = 0.0 observer_geographic_longitude = 0.0 Reference_Frame = B1950 coordinate_system = galactic positions = apparent Reference_system = geocentric [spectral] start_wavelength =12um end_wavelength=12um [Time] observation_date=2 2 2000 observation_time=0 0 0.0

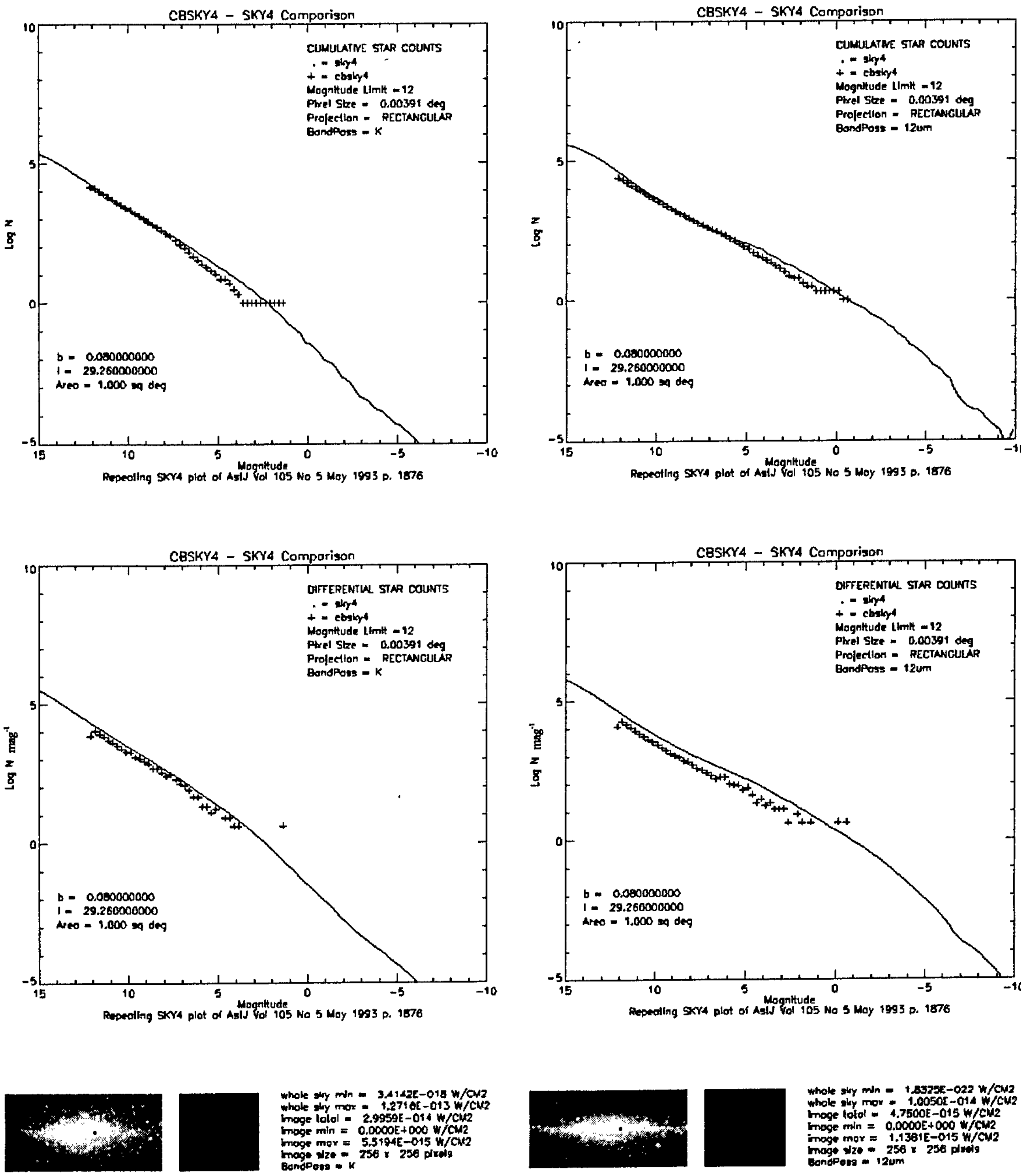


Figure A.4: SKY4 - CBSKY4 comparison for l = 29.26, b = 0.08.

Table A.9: Interactive inputs used for the SKY4 runs for l = 39.96, b = 0.07.

Value Used	Description
y	Keep solar displacement of 15 pc N of plane.
n	Integrate over area? No, model 1 square degree.
0.0700	Center galactic latitude in degrees.
39.9600	Center galactic longitude in degrees.
n	No, don't print bright magnitudes-by-components information.
n	No, don't print surface brightness data.
n	No, don't bring back colors.
y	Yes, create LogN vs. LogS plots.
5 and 7	Use the pre-defined "12UM" bandpass (value=7) and use the pre-defined "K" bandpass (value=5) [Two separate sky4 runs.]
y and n	y = plot cumulative LogN on the y-axis; n = plot differential LogN on the y-axis [Two separate sky4 runs.]
y	Plot Magnitudes on x-axis.
n	No, don't plot observed points.

Table A.10: CBSKY4 Inputs for l = 39.96, b = 0.07.

[Path] architecture = DOS path=\cbsd4\dataout\cbsky4\AJ_May1993_12um\ code_path=\cbsd4\cbsd\cbsky4 data_path=\cbsd4\cbsd\sky4data verbose = YES [cbsky4] log_output = Case_6.log map = NO real_stars = NO statistical_stars = YES clouds = YES magnitude_limit = 12 seed = 346 method = catalog = NO catalog_limit = 10 nodesfile = NODE_IAH.DAT elementsfile = ELEM_IAH.DAT extinction = YES count_statistics = YES x-axis = MAGNITUDES y-axis = Differential errmap = NO extmap = NO spectral_type = 0 [convolution] convolution = NO point_spread_function = gaussian psf_half_width = 1.01	[Image] Image = YES output_format = FITS image_type=4-BYTE REAL image_projection = RECTANGULAR x_column_pixels = 256 y_row_pixels = 256 pixel_size = 0.0039062500000 image_center_longitude_degrees = 39.960000000 image_center_latitude = 0.070000000 units = W/CM2 [Positional] observer_altitude = 0.0 observer_geographic_latitude = 0.0 observer_geographic_longitude = 0.0 Reference_Frame = B1950 coordinate_system = galactic positions = apparent Reference_system = geocentric [spectral] start_wavelength =12um end_wavelength=12um [Time] observation_date=2 2 2000 observation_time=0 0 0.0

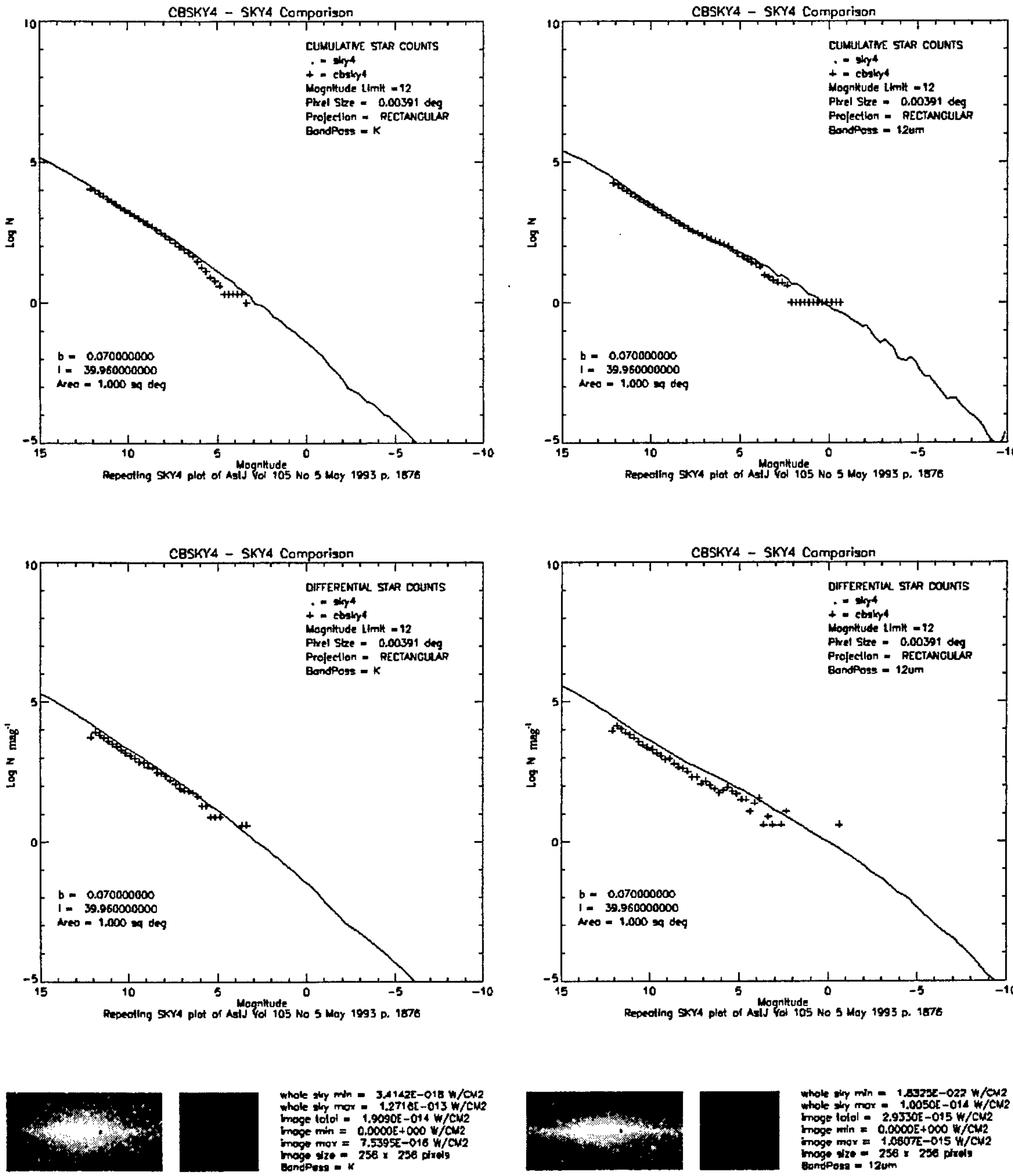


Figure A.5: SKY4 - CBSKY4 comparison for l = 39.96, b = 0.07.

Table A.11: Interactive inputs used for the SKY4 runs for l = 59.70, b = 0.09.

Value Used	Description
y	Keep solar displacement of 15 pc N of plane.
n	Integrate over area? No, model 1 square degree.
0.0900	Center galactic latitude in degrees.
59.7000	Center galactic longitude in degrees.
n	No, don't print bright magnitudes-by-components information.
n	No, don't print surface brightness data.
n	No, don't bring back colors.
y	Yes, create LogN vs. LogS plots.
5 and 7	Use the pre-defined "12UM" bandpass (value=7) and use the pre-defined "K" bandpass (value=5) [Two separate sky4 runs.]
y and n	y = plot cumulative LogN on the y-axis; n = plot differential LogN on the y-axis [Two separate sky4 runs.]
y	Plot Magnitudes on x-axis.
n	No, don't plot observed points.

Table A.12: CBSKY4 Inputs for l = 59.70, b = 0.09.

[Path] architecture = DOS path=\cbsd4\dataout\cbsky4\AJ_May19 93_12um\ code_path=\cbsd4\cbsd\cbsky4 data_path=\cbsd4\cbsd\sky4data verbose = YES [cbsky4] log_output = Case_7.log map = NO real_stars = NO statistical_stars = YES clouds = YES magnitude_limit = 12 seed = 346 method = catalog = NO catalog_limit = 10 nodesfile = NODE_IAH.DAT elementsfile = ELEM_IAH.DAT extinction = YES count_statistics = YES x-axis = MAGNITUDES y-axis = Differential errmap = NO extmap = NO spectral_type = 0 [convolution] convolution = NO point_spread_function = gaussian psf_half_width = 1.01	[Image] Image = YES output_format = FITS image_type=4-BYTE REAL image_projection = RECTANGULAR x_column_pixels = 256 y_row_pixels = 256 pixel_size = 0.0039062500000 image_center_longitude_degrees = 59.700000000 image_center_latitude = 0.090000000 units = W/CM2 [Positional] observer_altitude = 0.0 observer_geographic_latitude = 0.0 observer_geographic_longitude = 0.0 Reference_Frame = B1950 coordinate_system = galactic positions = apparent Reference_system = geocentric [spectral] start_wavelength =12um end_wavelength=12um [Time] observation_date=2 2 2000 observation_time=0 0 0.0

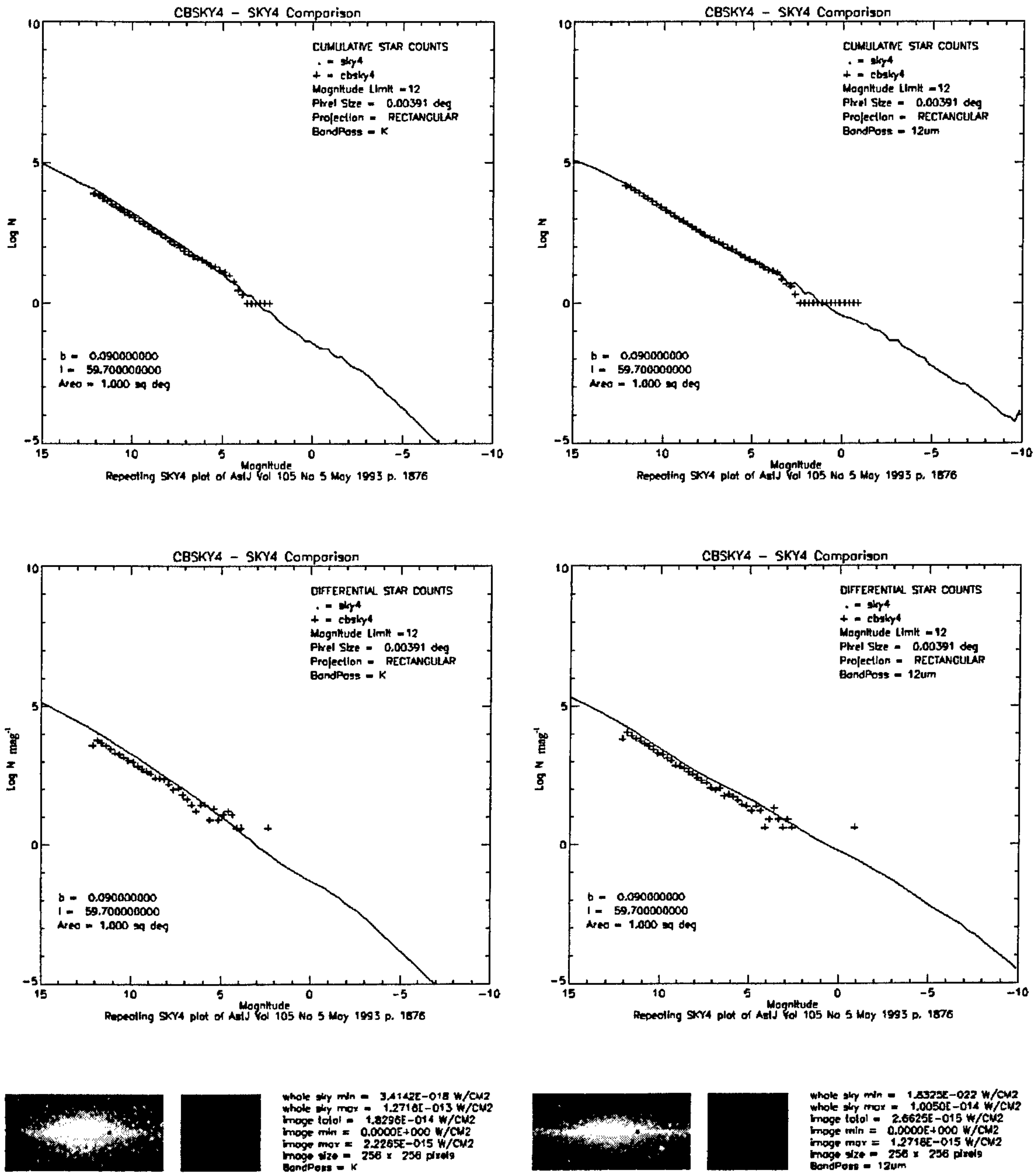


Figure A.6: SKY4 - CBSKY4 comparison for l = 59.70, b = 0.09.

Table A.13: Interactive inputs used for the SKY4 runs for l = 49.68, b = 0.16.

Value Used	Description
y	Keep solar displacement of 15 pc N of plane.
n	Integrate over area? No, model 1 square degree.
0.1600	Center galactic latitude in degrees.
49.6800	Center galactic longitude in degrees.
n	No, don't print bright magnitudes-by-components information.
n	No, don't print surface brightness data.
n	No, don't bring back colors.
y	Yes, create LogN vs. LogS plots.
5 and 7	Use the pre-defined "12UM" bandpass (value=7) and use the pre-defined "K" bandpass (value=5) [Two separate sky4 runs.]
y and n	y = plot cumulative LogN on the y-axis; n = plot differential LogN on the y-axis [Two separate sky4 runs.]
y	Plot Magnitudes on x-axis.
n	No, don't plot observed points.

Table A.14: CBSKY4 Inputs for l = 49.68, b = 0.16n.

[Path] architecture = DOS path=\cbsd4\dataout\cbsky4\AJ_May19 93_12um\ code_path=\cbsd4\cbsd\cbsky4 data_path=\cbsd4\cbsd\sky4data verbose = YES [cbsky4] log_output = Case_8.log map = NO real_stars = NO statistical_stars = YES clouds = YES magnitude_limit = 12 seed = 346 method = catalog = NO catalog_limit = 10 nodesfile = NODE_IAH.DAT elementsfile = ELEM_IAH.DAT extinction = YES count_statistics = YES x-axis = MAGNITUDES y-axis = Differential errmap = NO extmap = NO spectral_type = 0 [convolution] convolution = NO point_spread_function = gaussian psf_half_width = 1.01	[Image] Image = YES output_format = FITS image_type=4-BYTE REAL image_projection = RECTANGULAR x_column_pixels = 256 y_row_pixels = 256 pixel_size = 0.0039062500000 image_center_longitude_degrees = 49.680000000 image_center_latitude = 0.160000000 units = W/CM2 [Positional] observer_altitude = 0.0 observer_geographic_latitude = 0.0 observer_geographic_longitude = 0.0 Reference_Frame = B1950 coordinate_system = galactic positions = apparent Reference_system = geocentric [spectral] start_wavelength =12um end_wavelength=12um [Time] observation_date=2 2 2000 observation_time=0 0 0.0

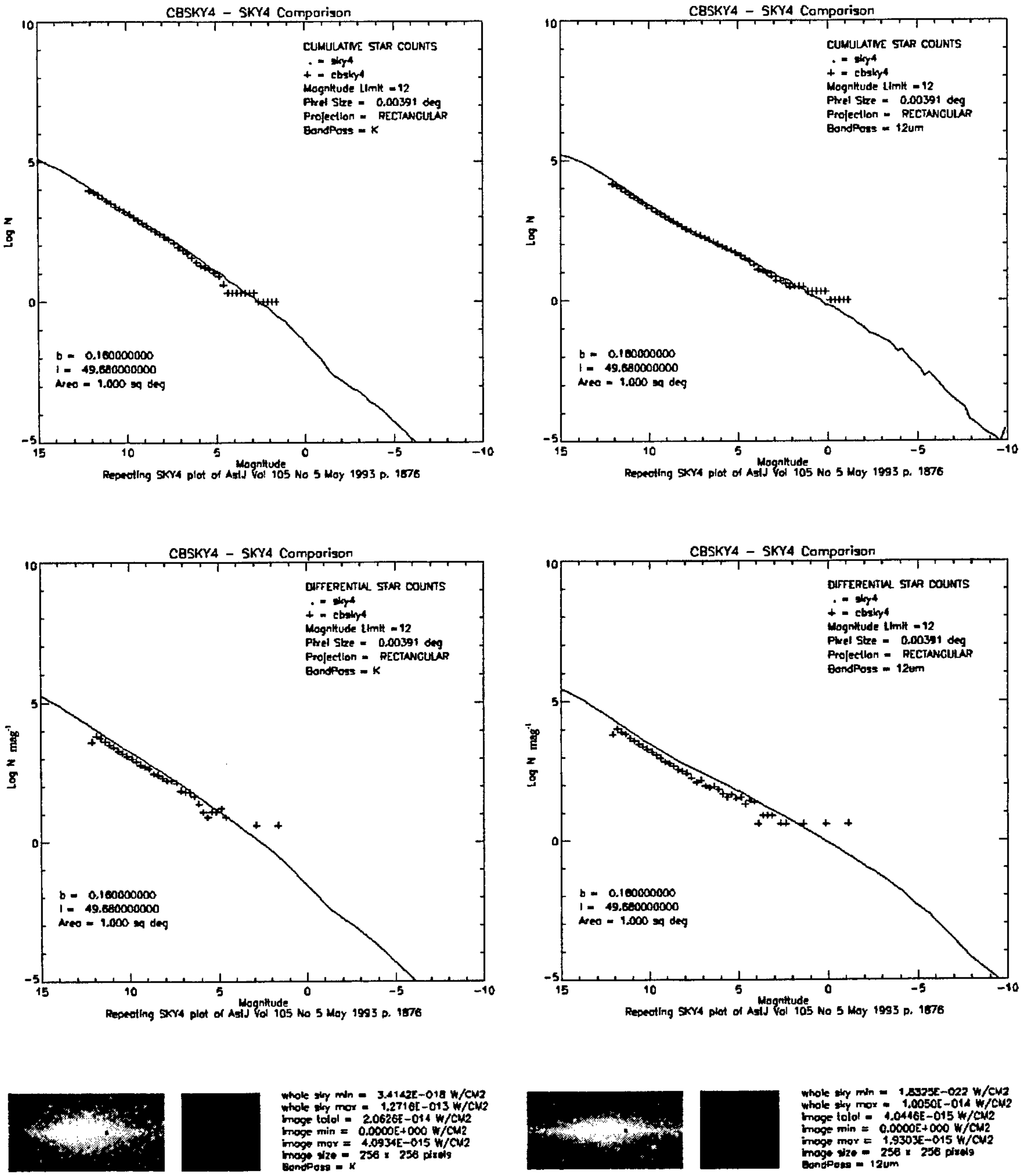


Figure A.7: SKY4 - CBSKY4 comparison for l = 49.68, b = 0.16.

Appendix B

Appendix B lists cases from the Cohen, February 1994 Astronomical Journal.

Tables B.1 and B.2 give the inputs for the SKY4 and CBSKY4 models respectively and Figure B.1 gives the resultant output for l = 80.0, b = 0.0 at 25μm.

Tables A.3 and A.4 give the inputs for the SKY4 and CBSKY4 models respectively and Figure A.2 gives the resultant output for l = 107.5, b = 1.25 at 12μm.

Tables A.5 and A.6 give the inputs for the SKY4 and CBSKY4 models respectively and Figure A.3 gives the resultant output for l = 1.0 b = -3.9 at Band B.

Tables A.7 and A.8 give the inputs for the SKY4 and CBSKY4 models respectively and Figure A.4 gives the resultant output for l = 1.0, b = -3.9 at Band V.

Tables A.9 and A.10 give the inputs for the SKY4 and CBSKY4 models respectively and Figure A.5 gives the resultant output for l = 342.0, b = -70.0 at 12μm.

Tables A.11 and A.12 give the inputs for the SKY4 and CBSKY4 models respectively and Figure A.6 gives the resultant output for l = 194.0, b = -60.0 at 12μm.

Tables A.13 and A.14 give the inputs for the SKY4 and CBSKY4 models respectively and Figure A.7 gives the resultant output for l = 73.0, b = 55.0 t 12μm.

Tables A.13 and A.14 give the inputs for the SKY4 and CBSKY4 models respectively and Figure A.7 gives the resultant output for l = 223.0, b = -52.0 at 12μm.

Tables A.13 and A.14 give the inputs for the SKY4 and CBSKY4 models respectively and Figure A.7 gives the resultant output for l = 345.0, b = -43.5 at 12μm.

Tables A.13 and A.14 give the inputs for the SKY4 and CBSKY4 models respectively and Figure A.7 gives the resultant output for l = 333.0, b = -13.0 at 12μm.

Tables A.13 and A.14 give the inputs for the SKY4 and CBSKY4 models respectively and Figure A.7 gives the resultant output for l = 5.5, b = -10.0 at 12μm.

Tables A.13 and A.14 give the inputs for the SKY4 and CBSKY4 models respectively and Figure A.7 gives the resultant output for l = 83.5, b = -9.0 at 12μm.

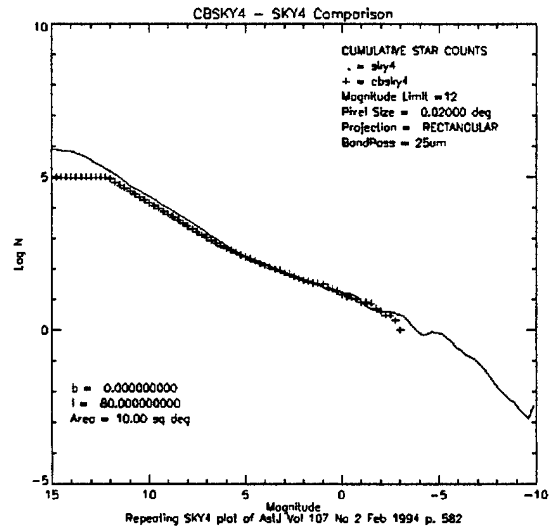
Table B.1: Interactive inputs used for the SKY4 runs for l = 80.0, b = 0.0 at 25μm.

Value Used	Description
y	Keep solar displacement of 15 pc N of plane.
y	Integrate over area? Yes, area integration.
-0.5 0.5	Limits of galactic latitude in degrees.
75 85	Limits of galactic longitude in degrees.
0.1 1	Lat/Lon step size in degrees.
n	No, don't print bright magnitudes-by-components information.
n	No, don't print surface brightness data.
n	No, don't bring back colors.
y	Yes, create LogN vs. LogS plots.
8	Enter passband: 1=B 2=V 3=J 4=H 5=K 6=2.4um 7=12um 8=25um 9=special 10=1565A 11=1400A 12=1660A
y and n	y = plot cumulative LogN on the y-axis; n = plot differential LogN on the y-axis [Two separate sky4 runs.]
y	Plot Magnitudes on x-axis.
n	No, don't plot observed points.

Table B.2: CBSKY4 Inputs for l = 80.0, b = 0.0 at 25µm.

```
[Path]
architecture = DOS
path=\cbsd4\dataout\cbsky4\AJ_Feb19
94\
code_path=\cbsd4\cbsd\cbsky4
data_path=\cbsd4\cbsd\sky4data
verbose = YES

[cbsky4]
log_output = Case_1.log
map = NO
real_stars = NO
statistical_stars = YES
clouds = YES
magnitude_limit = 12
seed = 346
method = CENTER
catalog = NO
catalog_limit = 10
nodesfile = NODE_IAH.DAT
elementsfile = ELEM_IAH.DAT
extinction = YES
count_statistics = YES
x-axis = MAGNITUDES
y-axis = Differential
errmap = NO
extmap = NO
spectral_type = 0

[convolution]
convolution = NO
point_spread_function = gaussian
psf_half_width = 1.01
```

```
[Image]
Image = YES
output_format = FITS
image_type=4-BYTE REAL
image_projection = RECTANGULAR
x_column_pixels = 500
y_row_pixels = 50
pixel_size = 0.0200000000000
image_center_longitude_degrees =
80.000000000
image_center_latitude = 0.000000000
units = W/CM2

[Positional]
observer_altitude = 0.0
observer_geographic_latitude = 0.0
observer_geographic_longitude = 0.0
Reference_Frame = B1950
coordinate_system = galactic
positions = apparent
Reference_system = geocentric

[spectral]
start_wavelength =25um
end_wavelength=25um

[Time]
observation_date=2 2 2000
observation_time=0 0 0.0
```



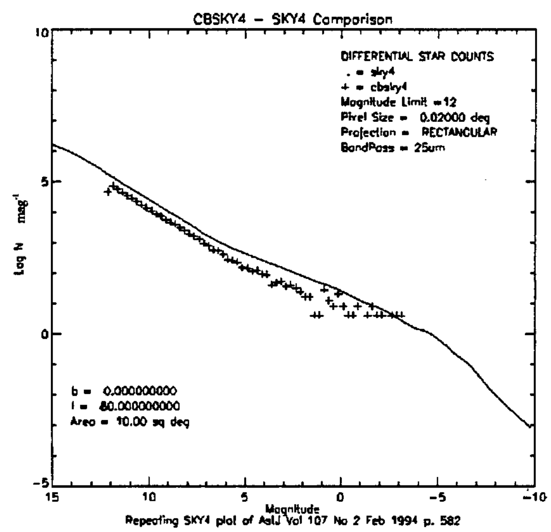


Figure B.1: SKY4 - CBSKY4 comparison for l = 80.0, b = 0.0 at 25μm.

Table B.3: Interactive inputs used for the SKY4 runs for $l = 107.5$, $b = 1.25$ at $12\mu m$.

Value Used	Description
y	Keep solar displacement of 15 pc N of plane.
y	Integrate over area? Yes, area integration.
0.5 2	Limits of galactic latitude in degrees.
100 115	Limits of galactic longitude in degrees.
0.15 1.5	Lat/Lon step size in degrees.
n	No, don't print bright magnitudes-by-components information.
n	No, don't print surface brightness data.
n	No, don't bring back colors.
y	Yes, create LogN vs. LogS plots.
7	Enter passband: 1=B 2=V 3=J 4=H 5=K 6=2.4um 7=12um 8=25um 9=special 10=1565A 11=1400A 12=1660A
y and n	y = plot cumulative LogN on the y-axis; n = plot differential LogN on the y-axis [Two separate sky4 runs.]
y	Plot Magnitudes on x-axis.
n	No, don't plot observed points.

Table B.4: CBSKY4 Inputs for l = 107.5, b = 1.25at 12μm.

[Path] architecture = DOS path=\cbsd4\dataout\cbsky4\AJ_Feb19 94\ code_path=\cbsd4\cbsd\cbsky4 data_path=\cbsd4\cbsd\sky4data verbose = YES [cbsky4] log_output = Case_2.log map = NO real_stars = NO statistical_stars = YES clouds = YES magnitude_limit = 12 seed = 346 method = CENTER catalog = NO catalog_limit = 10 nodesfile = NODE_IAH.DAT elementsfile = ELEM_IAH.DAT extinction = YES count_statistics = YES x-axis = MAGNITUDES y-axis = Differential errmap = NO extmap = NO spectral_type = 0 [convolution] convolution = NO point_spread_function = gaussian psf_half_width = 1.01	[Image] Image = YES output_format = FITS image_type=4-BYTE REAL image_projection = RECTANGULAR x_column_pixels = 750 y_row_pixels = 75 pixel_size = 0.0200000000000 image_center_longitude_degrees = 107.500000000 image_center_latitude = 1.250000000 units = W/CM2 [Positional] observer_altitude = 0.0 observer_geographic_latitude = 0.0 observer_geographic_longitude = 0.0 Reference_Frame = B1950 coordinate_system = galactic positions = apparent Reference_system = geocentric [spectral] start_wavelength =12um end_wavelength=12um [Time] observation_date=2 2 2000 observation_time=0 0 0.0

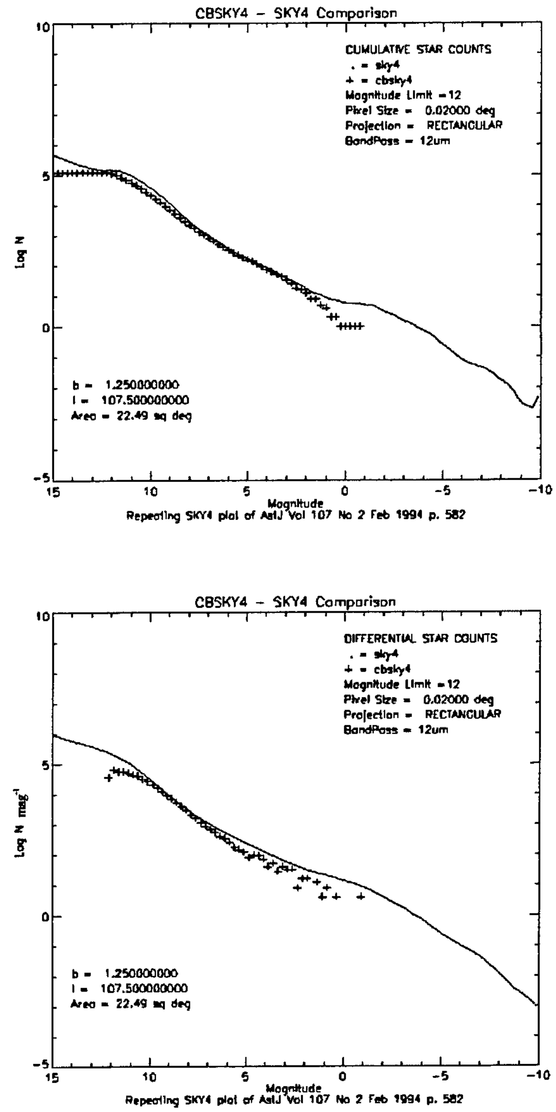


Figure B.2: SKY4 - CBSKY4 comparison for l = 107.5, b = 1.25 at 12μm.

Table B.5: Interactive inputs used for the SKY4 runs for l = 1.0, b = -3.9 at Band B.

Value Used	Description
y	Keep solar displacement of 15 pc N of plane.
y	Integrate over area? Yes, area integration.
0.5 1.5	Limits of galactic latitude in degrees.
-4.4 -3.4	Limits of galactic longitude in degrees.
0.01 0.01	Lat/Lon step size in degrees.
n	No, don't print bright magnitudes-by-components information.
n	No, don't print surface brightness data.
n	No, don't bring back colors.
y	Yes, create LogN vs. LogS plots.
1	Enter passband: 1=B 2=V 3=J 4=H 5=K 6=2.4um 7=12um 8=25um 9=special 10=1565A 11=1400A 12=1660A
y and n	y = plot cumulative LogN on the y-axis; n = plot differential LogN on the y-axis [Two separate sky4 runs.]
y	Plot Magnitudes on x-axis.
n	No, don't plot observed points.

Table B.6: CBSKY4 Inputs for l = 1.0, b = -3.9 at Band B.

[Path] architecture = DOS path=\cbsd4\dataout\cbsky4\AJ_Feb19 94\ code_path=\cbsd4\cbsd\cbsky4 data_path=\cbsd4\cbsd\sky4data verbose = YES [cbsky4] log_output = Case_3.log map = NO real_stars = NO statistical_stars = YES clouds = YES magnitude_limit = 12 seed = 346 method = CENTER catalog = NO catalog_limit = 10 nodesfile = NODE_IAH.DAT elementsfile = ELEM_IAH.DAT extinction = YES count_statistics = YES x-axis = MAGNITUDES y-axis = Differential errmap = NO extmap = NO spectral_type = 0 [convolution] convolution = NO point_spread_function = gaussian psf_half_width = 1.01	[Image] Image = YES output_format = FITS image_type=4-BYTE REAL image_projection = RECTANGULAR x_column_pixels = 50 y_row_pixels = 50 pixel_size = 0.0200000000000 image_center_longitude_degrees = 1.000000000 image_center_latitude = - 3.900000000 units = W/CM2 [Positional] observer_altitude = 0.0 observer_geographic_latitude = 0.0 observer_geographic_longitude = 0.0 Reference_Frame = B1950 coordinate_system = galactic positions = apparent Reference_system = geocentric [spectral] start_wavelength =B end_wavelength=B [Time] observation_date=2 2 2000 observation_time=0 0 0.0

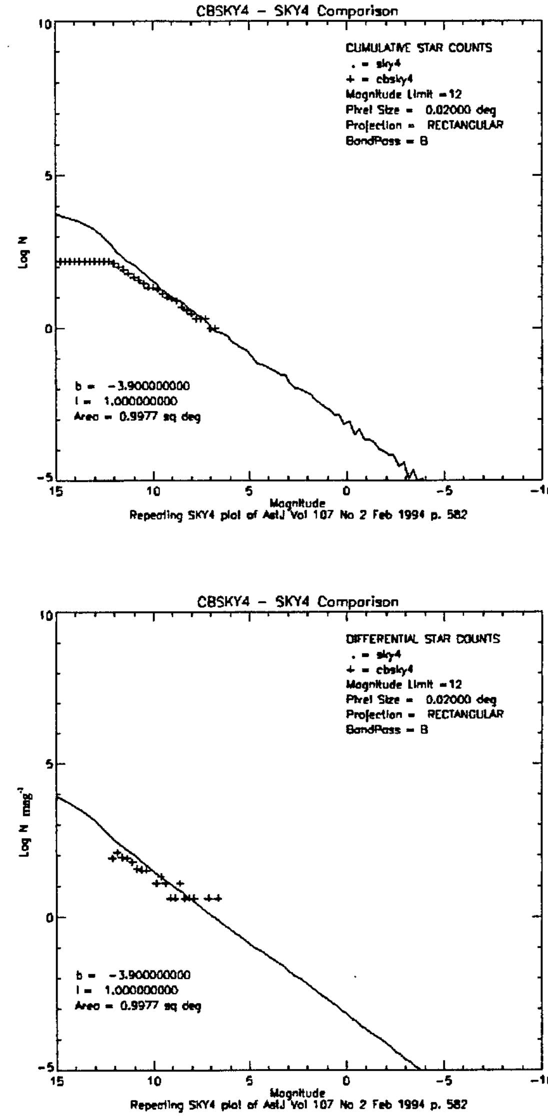


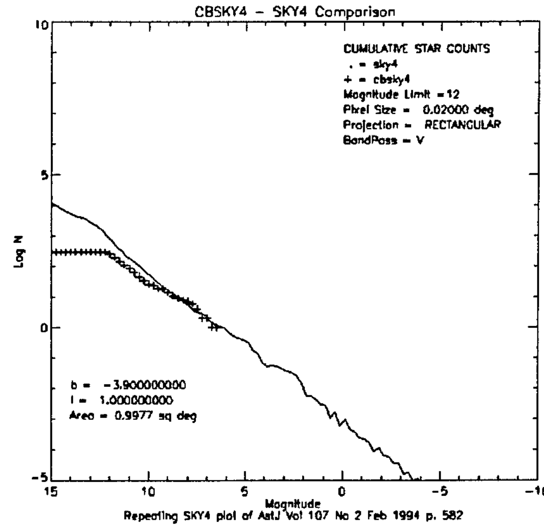
Figure B.3: SKY4 - CBSKY4 comparison for l = 1.0, b = -3.9 at Band B.

Table B.7: Interactive inputs used for the SKY4 runs for l = 1.0, b = -3.9 at Band V.

Value Used	Description
y	Keep solar displacement of 15 pc N of plane.
y	Integrate over area? Yes, area integration.
0.5 1.5	Limits of galactic latitude in degrees.
-4.4 -3.4	Limits of galactic longitude in degrees.
0.1 0.1	Lat/Lon step size in degrees.
n	No, don't print bright magnitudes-by-components information.
n	No, don't print surface brightness data.
n	No, don't bring back colors.
y	Yes, create LogN vs. LogS plots.
2	Enter passband: 1=B 2=V 3=J 4=H 5=K 6=2.4um 7=12um 8=25um 9=special 10=1565A 11=1400A 12=1660A
y and n	y = plot cumulative LogN on the y-axis; n = plot differential LogN on the y-axis [Two separate sky4 runs.]
y	Plot Magnitudes on x-axis.
n	No, don't plot observed points.

Table B.8: CBSKY4 Inputs for l = 1.0, b = -3.9 at Band V.

[Path] architecture = DOS path=\cbsd4\dataout\cbsky4\AJ_Feb1994\ code_path=\cbsd4\cbsd\cbsky4 data_path=\cbsd4\cbsd\sky4data verbose = YES [cbsky4] log_output = Case_4.log map = NO real_stars = NO statistical_stars = YES clouds = YES magnitude_limit = 12 seed = 346 method = CENTER catalog = NO catalog_limit = 10 nodesfile = NODE_IAH.DAT elementsfile = ELEM_IAH.DAT extinction = YES count_statistics = YES x-axis = MAGNITUDES y-axis = Differential errmap = NO extmap = NO spectral_type = 0 [convolution] convolution = NO point_spread_function = gaussian psf_half_width = 1.01	[Image] Image = YES output_format = FITS image_type=4-BYTE REAL image_projection = RECTANGULAR x_column_pixels = 50 y_row_pixels = 50 pixel_size = 0.0200000000000 image_center_longitude_degrees = 1.000000000 image_center_latitude = -3.900000000 units = W/CM2 [Positional] observer_altitude = 0.0 observer_geographic_latitude = 0.0 observer_geographic_longitude = 0.0 Reference_Frame = B1950 coordinate_system = galactic positions = apparent Reference_system = geocentric [spectral] start_wavelength =V end_wavelength=V [Time] observation_date=2 2 2000 observation_time=0 0 0.0



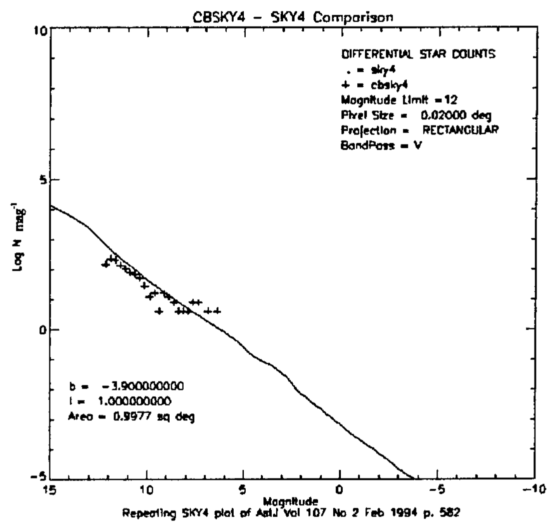


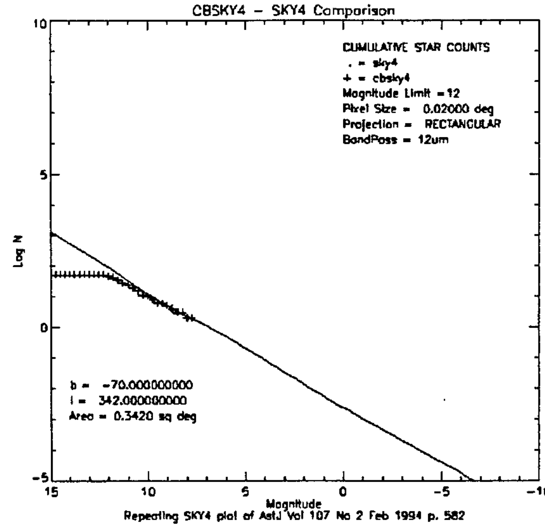
Figure B.4: SKY4 - CBSKY4 comparison for l = 1.0, b = -3.9 at Band V.

Table B.9: Interactive inputs used for the SKY4 runs for l = 342.0, b = -70.0 at 12μm.

Value Used	Description
y	Keep solar displacement of 15 pc N of plane.
y	Integrate over area? Yes, area integration.
-70.5 -69.5	Limits of galactic latitude in degrees.
341.5 342.5	Limits of galactic longitude in degrees.
0.1 0.1	Lat/Lon step size in degrees.
n	No, don't print bright magnitudes-by-components information.
n	No, don't print surface brightness data.
n	No, don't bring back colors.
y	Yes, create LogN vs. LogS plots.
7	Enter passband: 1=B 2=V 3=J 4=H 5=K 6=2.4um 7=12um 8=25um 9=special 10=1565A 11=1400A 12=1660A
y and n	y = plot cumulative LogN on the y-axis; n = plot differential LogN on the y-axis [Two separate sky4 runs.]
y	Plot Magnitudes on x-axis.
n	No, don't plot observed points.

Table B.10: CBSKY4 Inputs for l = 342.0, b = -70.0 at 12μm.

[Path] architecture = DOS path=\cbsd4\dataout\cbsky4\AJ_Feb19 94\ code_path=\cbsd4\cbsd\cbsky4 data_path=\cbsd4\cbsd\sky4data verbose = YES [cbsky4] log_output = Case_5.log map = NO real_stars = NO statistical_stars = YES clouds = YES magnitude_limit = 12 seed = 346 method = CENTER catalog = NO catalog_limit = 10 nodesfile = NODE_IAH.DAT elementsfile = ELEM_IAH.DAT extinction = YES count_statistics = YES x-axis = MAGNITUDES y-axis = Differential errmap = NO extmap = NO spectral_type = 0 [convolution] convolution = NO point_spread_function = gaussian psf_half_width = 1.01	[Image] Image = YES output_format = FITS image_type=4-BYTE REAL image_projection = RECTANGULAR x_column_pixels = 50 y_row_pixels = 50 pixel_size = 0.0200000000000 image_center_longitude_degrees = 342.000000000 image_center_latitude = - 70.000000000 units = W/CM2 [Positional] observer_altitude = 0.0 observer_geographic_latitude = 0.0 observer_geographic_longitude = 0.0 Reference_Frame = B1950 coordinate_system = galactic positions = apparent Reference_system = geocentric [spectral] start_wavelength =12um end_wavelength=12um [Time] observation_date=2 2 2000 observation_time=0 0 0.0



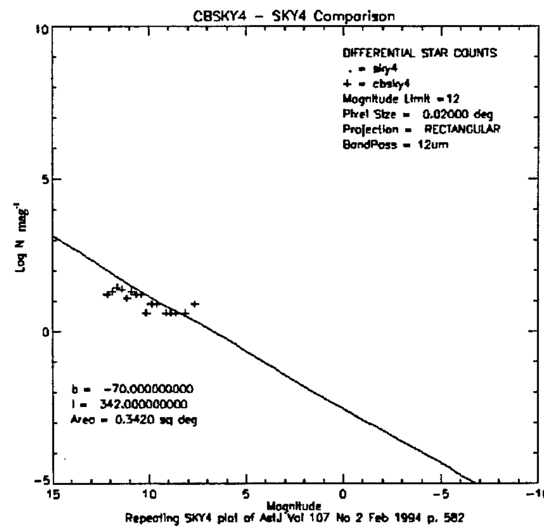


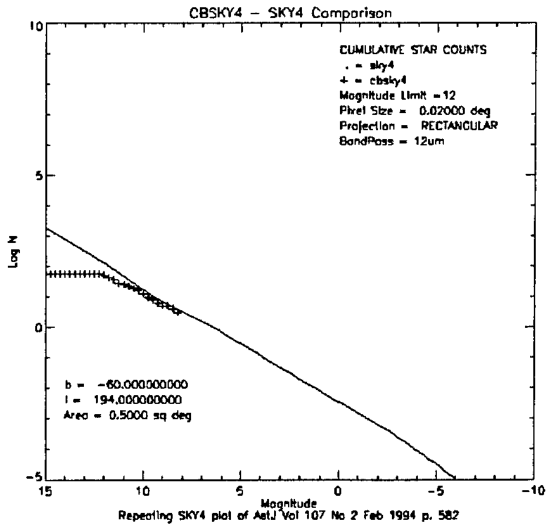
Figure B.5: SKY4 - CBSKY4 comparison for l = 342.0, b = -70.0 at 12μm.

Table B.11: Interactive inputs used for the SKY4 runs for l =194.0, b = -60.0 at 12μm.

Value Used	Description
y	Keep solar displacement of 15 pc N of plane.
y	Integrate over area? Yes, area integration.
-60.5 -59.5	Limits of galactic latitude in degrees.
193.5 194.5	Limits of galactic longitude in degrees.
0.1 0.1	Lat/Lon step size in degrees.
n	No, don't print bright magnitudes-by-components information.
n	No, don't print surface brightness data.
n	No, don't bring back colors.
y	Yes, create LogN vs. LogS plots.
7	Enter passband: 1=B 2=V 3=J 4=H 5=K 6=2.4um 7=12um 8=25um 9=special 10=1565A 11=1400A 12=1660A
y and n	y = plot cumulative LogN on the y-axis; n = plot differential LogN on the y-axis [Two separate sky4 runs.]
y	Plot Magnitudes on x-axis.
n	No, don't plot observed points.

Table B.12: CBSKY4 Inputs for l =194.0, b = -60.0 at 12µm.

[Path] architecture = DOS path=\cbsd4\dataout\cbsky4\AJ_Feb19 94\ code_path=\cbsd4\cbsd\cbsky4 data_path=\cbsd4\cbsd\sky4data verbose = YES [cbsky4] log_output = Case_6.log map = NO real_stars = NO statistical_stars = YES clouds = YES magnitude_limit = 12 seed = 346 method = CENTER catalog = NO catalog_limit = 10 nodesfile = NODE_IAH.DAT elementsfile = ELEM_IAH.DAT extinction = YES count_statistics = YES x-axis = MAGNITUDES y-axis = Differential errmap = NO extmap = NO spectral_type = 0 [convolution] convolution = NO point_spread_function = gaussian psf_half_width = 1.01	[Image] Image = YES output_format = FITS image_type=4-BYTE REAL image_projection = RECTANGULAR x_column_pixels = 50 y_row_pixels = 50 pixel_size = 0.0200000000000 image_center_longitude_degrees = 194.000000000 image_center_latitude = - 60.000000000 units = W/CM2 [Positional] observer_altitude = 0.0 observer_geographic_latitude = 0.0 observer_geographic_longitude = 0.0 Reference_Frame = B1950 coordinate_system = galactic positions = apparent Reference_system = geocentric [spectral] start_wavelength =12um end_wavelength=12um [Time] observation_date=2 2 2000 observation_time=0 0 0.0



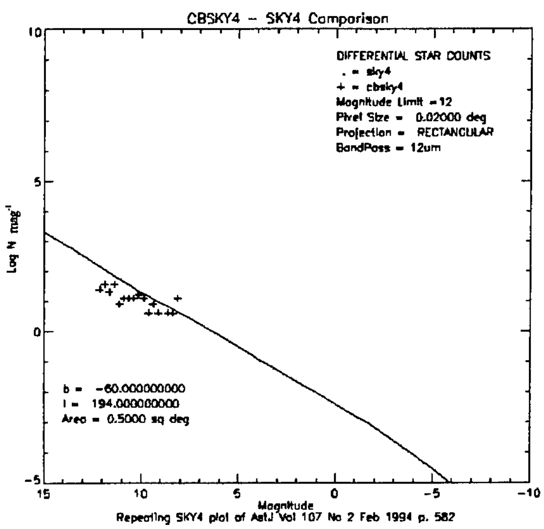


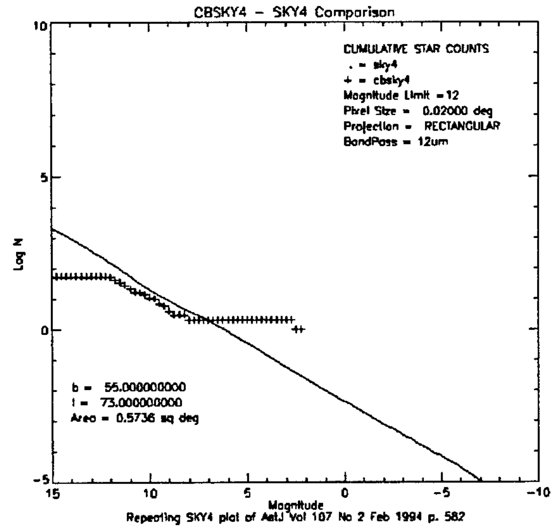
Figure B.6: SKY4 - CBSKY4 comparison for l =194.0, b = -60.0 at 12μm.

Table B.13: Interactive inputs used for the SKY4 runs for l =73.0, b = 55.0 at 12μm.

Value Used	Description
y	Keep solar displacement of 15 pc N of plane.
y	Integrate over area? Yes, area integration.
54.5 55.5	Limits of galactic latitude in degrees.
72.5 73.5	Limits of galactic longitude in degrees.
0.1 0.1	Lat/Lon step size in degrees.
n	No, don't print bright magnitudes-by-components information.
n	No, don't print surface brightness data.
n	No, don't bring back colors.
y	Yes, create LogN vs. LogS plots.
7	Enter passband: 1=B 2=V 3=J 4=H 5=K 6=2.4um 7=12um 8=25um 9=special 10=1565A 11=1400A 12=1660A
y and n	y = plot cumulative LogN on the y-axis; n = plot differential LogN on the y-axis [Two separate sky4 runs.]
y	Plot Magnitudes on x-axis.
n	No, don't plot observed points.

Table B.14: CBSKY4 Inputs for l =73.0, b = 55.0 at 12μm.

[Path]	[Image]
architecture = DOS	Image = YES
path=\cbsd4\dataout\cbsky4\AJ_Feb19	output_format = FITS
94\	image_type=4-BYTE REAL
code_path=\cbsd4\cbsd\cbsky4	image_projection = RECTANGULAR
data_path=\cbsd4\cbsd\sky4data	x_column_pixels = 50
verbose = YES	y_row_pixels = 50
	pixel_size = 0.0200000000000
[cbsky4]	image_center_longitude_degrees =
log_output = Case_7.log	73.000000000
map = NO	image_center_latitude =
real_stars = NO	55.000000000
statistical_stars = YES	units = W/CM2
clouds = YES	
magnitude_limit = 12	[Positional]
seed = 346	observer_altitude = 0.0
method = CENTER	observer_geographic_latitude = 0.0
catalog = NO	observer_geographic_longitude = 0.0
catalog_limit = 10	Reference_Frame = B1950
nodesfile = NODE_IAH.DAT	coordinate_system = galactic
elementsfile = ELEM_IAH.DAT	positions = apparent
extinction = YES	Reference_system = geocentric
count_statistics = YES	
x-axis = MAGNITUDES	[spectral]
y-axis = Differential	start_wavelength =12um
errmap = NO	end_wavelength=12um
extmap = NO	
spectral_type = 0	[Time]
	observation_date=2 2 2000
[convolution]	observation_time=0 0 0.0
convolution = NO	
point_spread_function = gaussian	
psf_half_width = 1.01	



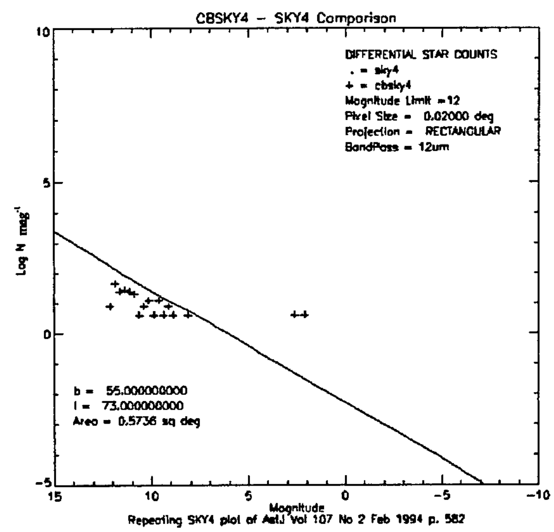


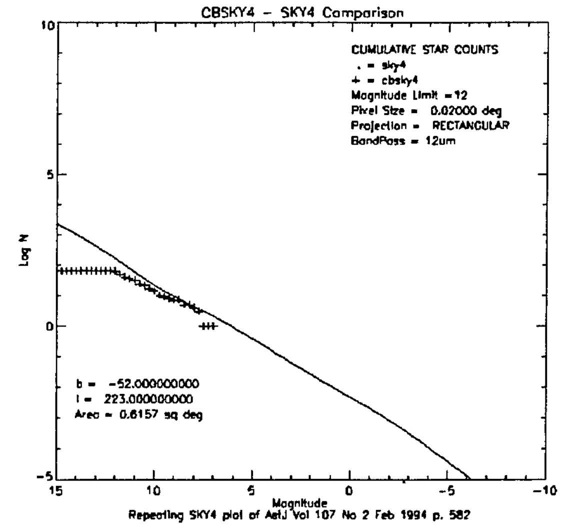
Figure B.7: SKY4 - CBSKY4 comparison for l =73.0, b = 55.0 at 12μm.

Table B.15: Interactive inputs used for the SKY4 runs for l =223.0, b = -52.0 at 12μm.

Value Used	Description
y	Keep solar displacement of 15 pc N of plane.
y	Integrate over area? Yes, area integration.
-52.5 -51.5	Limits of galactic latitude in degrees.
222.5 223.5	Limits of galactic longitude in degrees.
0.1 0.1	Lat/Lon step size in degrees.
n	No, don't print bright magnitudes-by-components information.
n	No, don't print surface brightness data.
n	No, don't bring back colors.
y	Yes, create LogN vs. LogS plots.
7	Enter passband: 1=B 2=V 3=J 4=H 5=K 6=2.4um 7=12um 8=25um 9=special 10=1565A 11=1400A 12=1660A
y and n	y = plot cumulative LogN on the y-axis; n = plot differential LogN on the y-axis [Two separate sky4 runs.]
y	Plot Magnitudes on x-axis.
n	No, don't plot observed points.

Table B.16: CBSKY4 Inputs for l =223.0, b = -52.0 at 12µm.

[Path]	[Image]
architecture = DOS	Image = YES
path=\cbsd4\dataout\cbsky4\AJ_Feb19	output_format = FITS
94\	image_type=4-BYTE REAL
code_path=\cbsd4\cbsd\cbsky4	image_projection = RECTANGULAR
data_path=\cbsd4\cbsd\sky4data	x_column_pixels = 50
verbose = YES	y_row_pixels = 50
	pixel_size = 0.0200000000000
[cbsky4]	image_center_longitude_degrees =
log_output = Case_8.log	223.000000000
map = NO	image_center_latitude = -
real_stars = NO	52.000000000
statistical_stars = YES	units = W/CM2
clouds = YES	
magnitude_limit = 12	[Positional]
seed = 346	observer_altitude = 0.0
method = CENTER	observer_geographic_latitude = 0.0
catalog = NO	observer_geographic_longitude = 0.0
catalog_limit = 10	Reference_Frame = B1950
nodesfile = NODE_IAH.DAT	coordinate_system = galactic
elementsfile = ELEM_IAH.DAT	positions = apparent
extinction = YES	Reference_system = geocentric
count_statistics = YES	
x-axis = MAGNITUDES	[spectral]
y-axis = Differential	start_wavelength =12um
errmap = NO	end_wavelength=12um
extmap = NO	
spectral_type = 0	[Time]
	observation_date=2 2 2000
[convolution]	observation_time=0 0 0.0
convolution = NO	
point_spread_function = gaussian	
psf_half_width = 1.01	



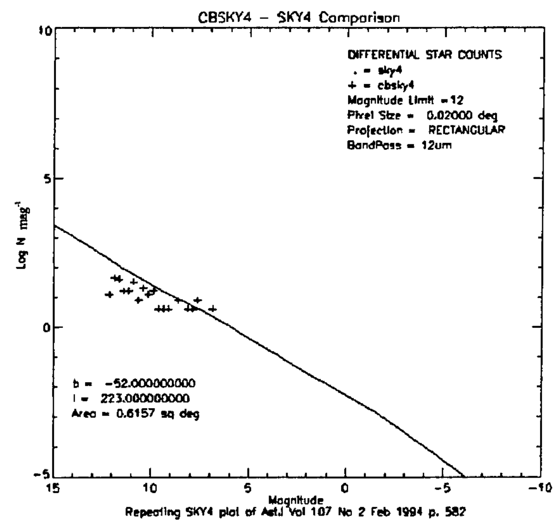


Figure B.8: SKY4 - CBSKY4 comparison for l =223.0, b = -52.0 at 12μm.

Table B.17: Interactive inputs used for the SKY4 runs for. l =345.0, b = -43.5 at 12μm.

Value Used	Description
y	Keep solar displacement of 15 pc N of plane.
y	Integrate over area? Yes, area integration.
-44 -43	Limits of galactic latitude in degrees.
344.5 345.5	Limits of galactic longitude in degrees.
0.1 0.1	Lat/Lon step size in degrees.
n	No, don't print bright magnitudes-by-components information.
n	No, don't print surface brightness data.
n	No, don't bring back colors.
y	Yes, create LogN vs. LogS plots.
7	Enter passband: 1=B 2=V 3=J 4=H 5=K 6=2.4um 7=12um 8=25um 9=special 10=1565A 11=1400A 12=1660A
y and n	y = plot cumulative LogN on the y-axis; n = plot differential LogN on the y-axis [Two separate sky4 runs.]
y	Plot Magnitudes on x-axis.
n	No, don't plot observed points.

Table B.18: CBSKY4 Inputs for l =345.0, b = -43.5 at 12μm.

[Path] architecture = DOS path=\cbsd4\dataout\cbsky4\AJ_Feb19 94\ code_path=\cbsd4\cbsd\cbsky4 data_path=\cbsd4\cbsd\sky4data verbose = YES [cbsky4] log_output = Case_9.log map = NO real_stars = NO statistical_stars = YES clouds = YES magnitude_limit = 12 seed = 346 method = CENTER catalog = NO catalog_limit = 10 nodesfile = NODE_IAH.DAT elementsfile = ELEM_IAH.DAT extinction = YES count_statistics = YES x-axis = MAGNITUDES y-axis = Differential errmap = NO extmap = NO spectral_type = 0 [convolution] convolution = NO point_spread_function = gaussian psf_half_width = 1.01	[Image] Image = YES output_format = FITS image_type=4-BYTE REAL image_projection = RECTANGULAR x_column_pixels = 50 y_row_pixels = 50 pixel_size = 0.0200000000000 image_center_longitude_degrees = 345.000000000 image_center_latitude = - 43.500000000 units = W/CM2 [Positional] observer_altitude = 0.0 observer_geographic_latitude = 0.0 observer_geographic_longitude = 0.0 Reference_Frame = B1950 coordinate_system = galactic positions = apparent Reference_system = geocentric [spectral] start_wavelength =12um end_wavelength=12um [Time] observation_date=2 2 2000 observation_time=0 0 0.0

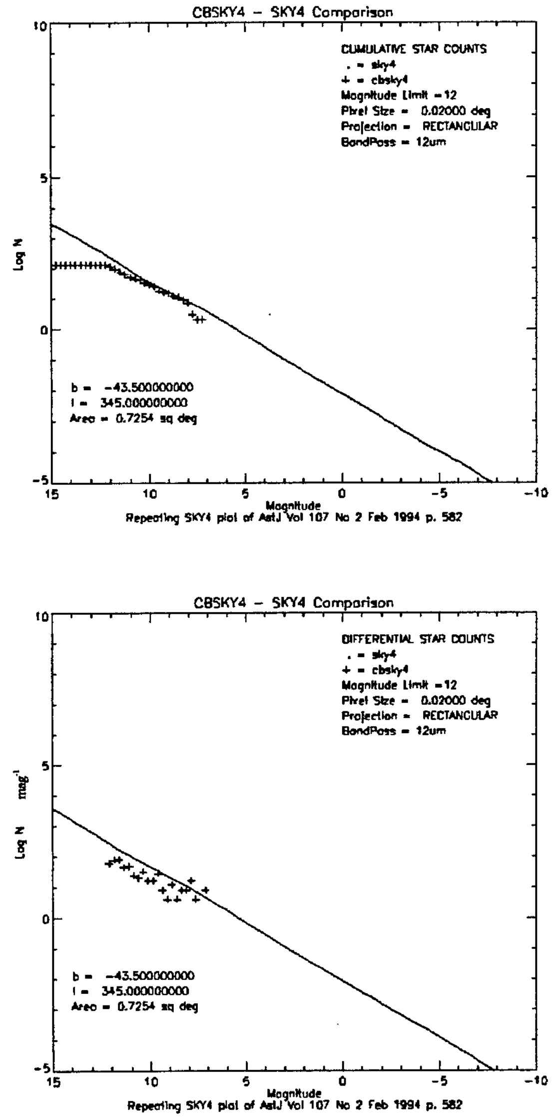


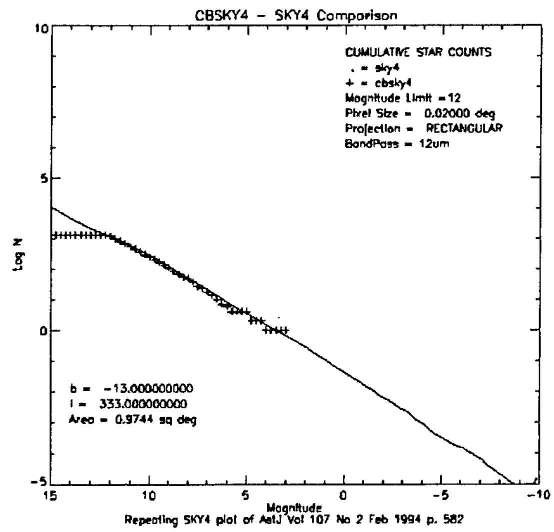
Figure B.9: SKY4 - CBSKY4 comparison for l =345.0, b = -43.5 at 12μm.

Table B.19: Interactive inputs used for the SKY4 runs for l =333.0, b = -13.0 at 12μm.

Value Used	Description
y	Keep solar displacement of 15 pc N of plane.
y	Integrate over area? Yes, area integration.
-13.5 -12.5	Limits of galactic latitude in degrees.
332.5 333.5	Limits of galactic longitude in degrees.
0.1 0.1	Lat/Lon step size in degrees.
n	No, don't print bright magnitudes-by-components information.
n	No, don't print surface brightness data.
n	No, don't bring back colors.
y	Yes, create LogN vs. LogS plots.
7	Enter passband: 1=B 2=V 3=J 4=H 5=K 6=2.4um 7=12um 8=25um 9=special 10=1565A 11=1400A 12=1660A
y and n	y = plot cumulative LogN on the y-axis; n = plot differential LogN on the y-axis [Two separate sky4 runs.]
y	Plot Magnitudes on x-axis.
n	No, don't plot observed points.

Table B.20: CBSKY4 Inputs for l =333.0, b = -13.0 at 12μm.

[Path] architecture = DOS path=\cbsd4\dataout\cbsky4\AJ_Feb19 94\ code_path=\cbsd4\cbsd\cbsky4 data_path=\cbsd4\cbsd\sky4data verbose = YES [cbsky4] log_output = Case_10.log map = NO real_stars = NO statistical_stars = YES clouds = YES magnitude_limit = 12 seed = 346 method = CENTER catalog = NO catalog_limit = 10 nodesfile = NODE_IAH.DAT elementsfile = ELEM_IAH.DAT extinction = YES count_statistics = YES x-axis = MAGNITUDES y-axis = Differential errmap = NO extmap = NO spectral_type = 0 [convolution] convolution = NO point_spread_function = gaussian psf_half_width = 1.01	[Image] Image = YES output_format = FITS image_type=4-BYTE REAL image_projection = RECTANGULAR x_column_pixels = 50 y_row_pixels = 50 pixel_size = 0.0200000000000 image_center_longitude_degrees = 333.000000000 image_center_latitude = - 13.000000000 units = W/CM2 [Positional] observer_altitude = 0.0 observer_geographic_latitude = 0.0 observer_geographic_longitude = 0.0 Reference_Frame = B1950 coordinate_system = galactic positions = apparent Reference_system = geocentric [spectral] start_wavelength =12um end_wavelength=12um [Time] observation_date=2 2 2000 observation_time=0 0 0.0



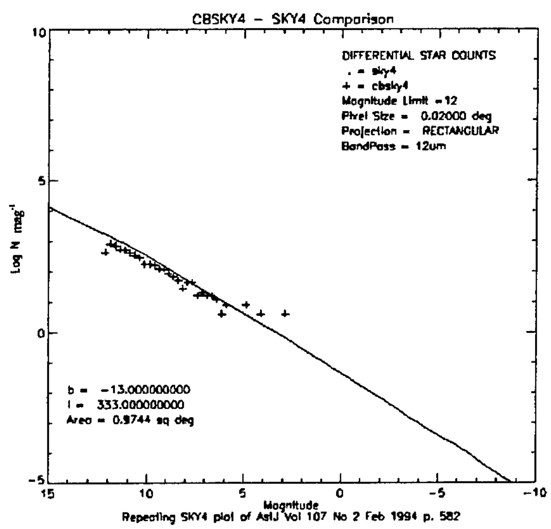


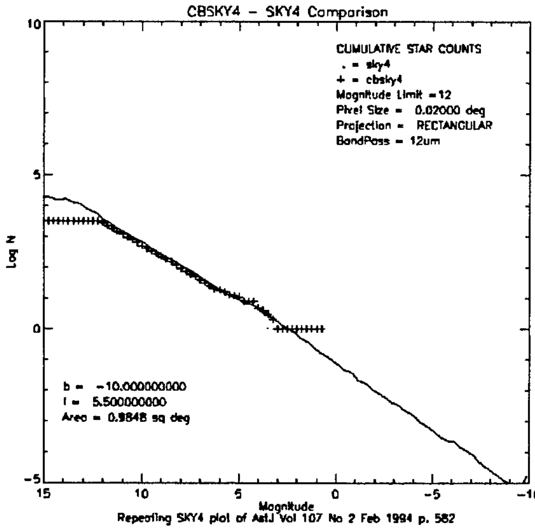
Figure B.10: SKY4 - CBSKY4 comparison for l =333.0, b = -13.0 at 12μm.

Table B.21: Interactive inputs used for the SKY4 runs for l =5.5, b = -10.0 at 12μm.

Value Used	Description
y	Keep solar displacement of 15 pc N of plane.
y	Integrate over area? Yes, area integration.
-10.5 -9.5	Limits of galactic latitude in degrees.
5 6	Limits of galactic longitude in degrees.
0.1 0.1	Lat/Lon step size in degrees.
n	No, don't print bright magnitudes-by-components information.
n	No, don't print surface brightness data.
n	No, don't bring back colors.
y	Yes, create LogN vs. LogS plots.
7	Enter passband: 1=B 2=V 3=J 4=H 5=K 6=2.4um 7=12um 8=25um 9=special 10=1565A 11=1400A 12=1660A
y and n	y = plot cumulative LogN on the y-axis; n = plot differential LogN on the y-axis [Two separate sky4 runs.]
y	Plot Magnitudes on x-axis.
n	No, don't plot observed points.

Table B.22: CBSKY4 Inputs for. l =5.5, b = -10.0 at 12µm.

[Path] architecture = DOS path=\cbsd4\dataout\cbsky4\AJ_Feb19 94\ code_path=\cbsd4\cbsd\cbsky4 data_path=\cbsd4\cbsd\sky4data verbose = YES [cbsky4] log_output = Case_11.log map = NO real_stars = NO statistical_stars = YES clouds = YES magnitude_limit = 12 seed = 346 method = CENTER catalog = NO catalog_limit = 10 nodesfile = NODE_IAH.DAT elementsfile = ELEM_IAH.DAT extinction = YES count_statistics = YES x-axis = MAGNITUDES y-axis = Differential errmap = NO extmap = NO spectral_type = 0 [convolution] convolution = NO point_spread_function = gaussian psf_half_width = 1.01	[Image] Image = YES output_format = FITS image_type=4-BYTE REAL image_projection = RECTANGULAR x_column_pixels = 50 y_row_pixels = 50 pixel_size = 0.0200000000000 image_center_longitude_degrees = 5.500000000 image_center_latitude = - 10.000000000 units = W/CM2 [Positional] observer_altitude = 0.0 observer_geographic_latitude = 0.0 observer_geographic_longitude = 0.0 Reference_Frame = B1950 coordinate_system = galactic positions = apparent Reference_system = geocentric [spectral] start_wavelength =12um end_wavelength=12um [Time] observation_date=2 2 2000 observation_time=0 0 0.0



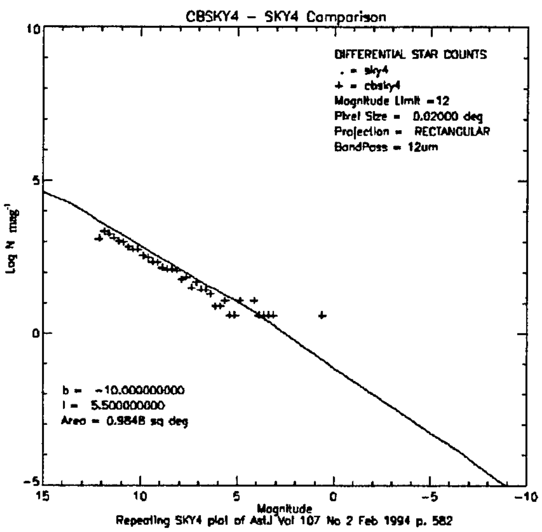


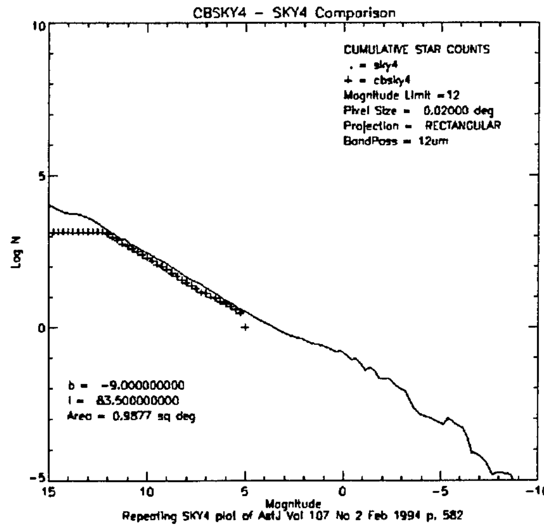
Figure B.11: SKY4 - CBSKY4 comparison for. l =5.5, b = -10.0 at 12μm.

Table B.23: Interactive inputs used for the SKY4 runs for l =83.5, b = -9.0 at 12μm.

Value Used	Description
y	Keep solar displacement of 15 pc N of plane.
y	Integrate over area? Yes, area integration.
-9.5 -8.5	Limits of galactic latitude in degrees.
83 84	Limits of galactic longitude in degrees.
0.1 0.1	Lat/Lon step size in degrees.
n	No, don't print bright magnitudes-by-components information.
n	No, don't print surface brightness data.
n	No, don't bring back colors.
y	Yes, create LogN vs. LogS plots.
7	Enter passband: 1=B 2=V 3=J 4=H 5=K 6=2.4um 7=12um 8=25um 9=special 10=1565A 11=1400A 12=1660A
y and n	y = plot cumulative LogN on the y-axis; n = plot differential LogN on the y-axis [Two separate sky4 runs.]
y	Plot Magnitudes on x-axis.
n	No, don't plot observed points.

Table B.24: CBSKY4 Inputs for l =83.5, b = -9.0 at 12μm.

[Path] architecture = DOS path=\cbsd4\dataout\cbsky4\AJ_Feb19 94\ code_path=\cbsd4\cbsd\cbsky4 data_path=\cbsd4\cbsd\sky4data verbose = YES [cbsky4] log_output = Case_12.log map = NO real_stars = NO statistical_stars = YES clouds = YES magnitude_limit = 12 seed = 346 method = CENTER catalog = NO catalog_limit = 10 nodesfile = NODE_IAH.DAT elementsfile = ELEM_IAH.DAT extinction = YES count_statistics = YES x-axis = MAGNITUDES y-axis = Differential errmap = NO extmap = NO spectral_type = 0 [convolution] convolution = NO point_spread_function = gaussian psf_half_width = 1.01	[Image] Image = YES output_format = FITS image_type=4-BYTE REAL image_projection = RECTANGULAR x_column_pixels = 50 y_row_pixels = 50 pixel_size = 0.0200000000000 image_center_longitude_degrees = 83.500000000 image_center_latitude = - 9.000000000 units = W/CM2 [Positional] observer_altitude = 0.0 observer_geographic_latitude = 0.0 observer_geographic_longitude = 0.0 Reference_Frame = B1950 coordinate_system = galactic positions = apparent Reference_system = geocentric [spectral] start_wavelength =12um end_wavelength=12um [Time] observation_date=2 2 2000 observation_time=0 0 0.0



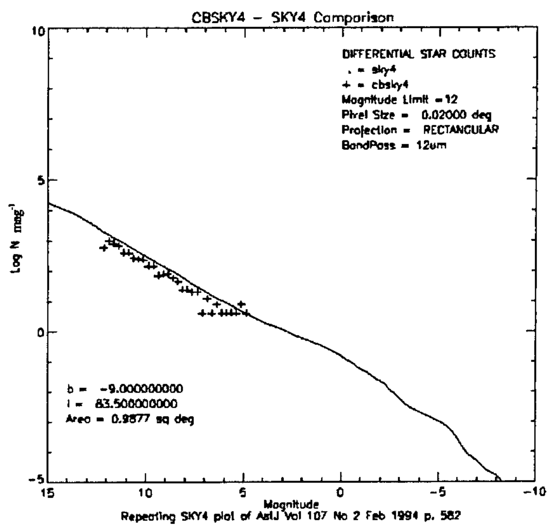


Figure B.12: SKY4 - CBSKY4 comparison for l =83.5, b = -9.0 at 12μm.

Appendix C

Appendix C.1

The region around l = -3 deg, b = 0 deg with the following pixel sizes (degrees) for Band K and 12μm:

10.0	5.56	1.0	0.556	0.10
0.0556	0.01	0.00556	0.001	0.000556

Table C.1: Interactive inputs used for the SKY4 runs around l =3.0, b = 0.0.

Value Used	Description
y	Keep solar displacement of 15 pc N of plane.
y	Integrate over area.
see Table C.2	Limits of galactic latitude in degrees.
see Table C.2	Limits of galactic longitude in degrees.
see Table C.2	Incremental steps in latitude and longitude (in degrees).
n	No, don't print bright magnitudes-by-components information.
n	No, don't print surface brightness data.
n	No, don't bring back colors.
y	Yes, create LogN vs. LogS plots.
5 and 7	Use the pre-defined "12UM" bandpass (value = 7) and use the pre-defined "K" bandpass (value = 5) [This value is regressed upon, there are two separate SKY4 runs.]
y and n	Yes, plot the cumulative LogN on the y-axis, and no, plot the differential LogN on the y-axis. [This value is regressed upon, there are two separate SKY4 runs.]
y	Plot Magnitudes on x-axis.
n	No, don't plot observed points.

Table C.2: Region Definitions for 10 deg around l =3.0, b = 0.0.

x_FOV (Deg)	Initial Latitude (Deg)	Final Latitude (Deg)	Initial Longitude (Deg)	Final Longitude (Deg)	Step Latitude (Deg)	Step Longitude (Deg)
1.00E+01	-8.00E+00	+2.00E+00	-5.00E+00	5.00E+00	1.00E+00	1.00E+00
5.56E+00	-5.78E+00	-2.22E-01	-2.78E+00	2.78E+00	5.56E-01	5.56E-01
1.00E+00	-3.50E+00	-2.50E+00	-5.00E-01	5.00E-01	1.00E-01	1.00E-01
5.56E-01	-3.28E+00	-2.72E+00	-2.78E-01	2.78E-01	5.56E-02	5.56E-02
1.00E-01	-3.05E+00	-2.95E+00	-5.00E-02	5.00E-02	1.00E-02	1.00E-02
5.56E-02	-3.03E+00	-2.97E+00	-2.78E-02	2.78E-02	5.56E-03	5.56E-03
1.00E-02	-3.01E+00	-3.00E+00	-5.00E-03	5.00E-03	1.00E-03	1.00E-03
5.56E-03	-3.00E+00	-3.00E+00	-2.78E-03	2.78E-03	5.56E-04	5.56E-04
1.00E-03	-3.00E+00	-3.00E+00	-5.00E-04	5.00E-04	1.00E-04	1.00E-04
5.56E-04	-3.00E+00	-3.00E+00	-2.78E-04	2.78E-04	5.56E-05	5.56E-05

Table C.3: CBSKY4 Inputs around l =3.0, b = 0.0.

```
[Path]
architecture = DOS
path=\cbsd4\dataout\cbsky4\ZoomIn_B
-3_L0_12um\
code_path=\cbsd4\cbsd\cbsky4
data_path=\cbsd4\cbsd\sky4data
verbose = YES

[cbsky4]
log_output = ZoomIn_P1.log
map = NO
real_stars = NO
statistical_stars = YES
clouds = YES
magnitude_limit = 15
seed = 346
method = CENTER
catalog = NO
catalog_limit = 10
nodesfile = NODE_IAH.DAT
elementsfile = ELEM_IAH.DAT
extinction = YES
count_statistics = YES
x-axis = MAGNITUDES
y-axis = Differential
errmap = NO
extmap = NO
spectral_type = 0

[convolution]
convolution = NO
point_spread_function = gaussian
psf_half_width = 1.01
```

```
[Image]
Image = YES
output_format = FITS
image_type=4-BYTE REAL
image_projection = RECTANGULAR
x_column_pixels = 1
y_row_pixels = 1
pixel_size = 10.0000000000000
image_center_longitude_degrees =
0.000000000
image_center_latitude = -
3.000000000
units = W/CM2

[Positional]
observer_altitude = 0.0
observer_geographic_latitude = 0.0
observer_geographic_longitude = 0.0
Reference_Frame = B1950
coordinate_system = galactic
positions = apparent
Reference_system = geocentric

[spectral]
start_wavelength =12um
end_wavelength=12um

[Time]
observation_date=2 2 2000
observation_time=0 0 0.0
```

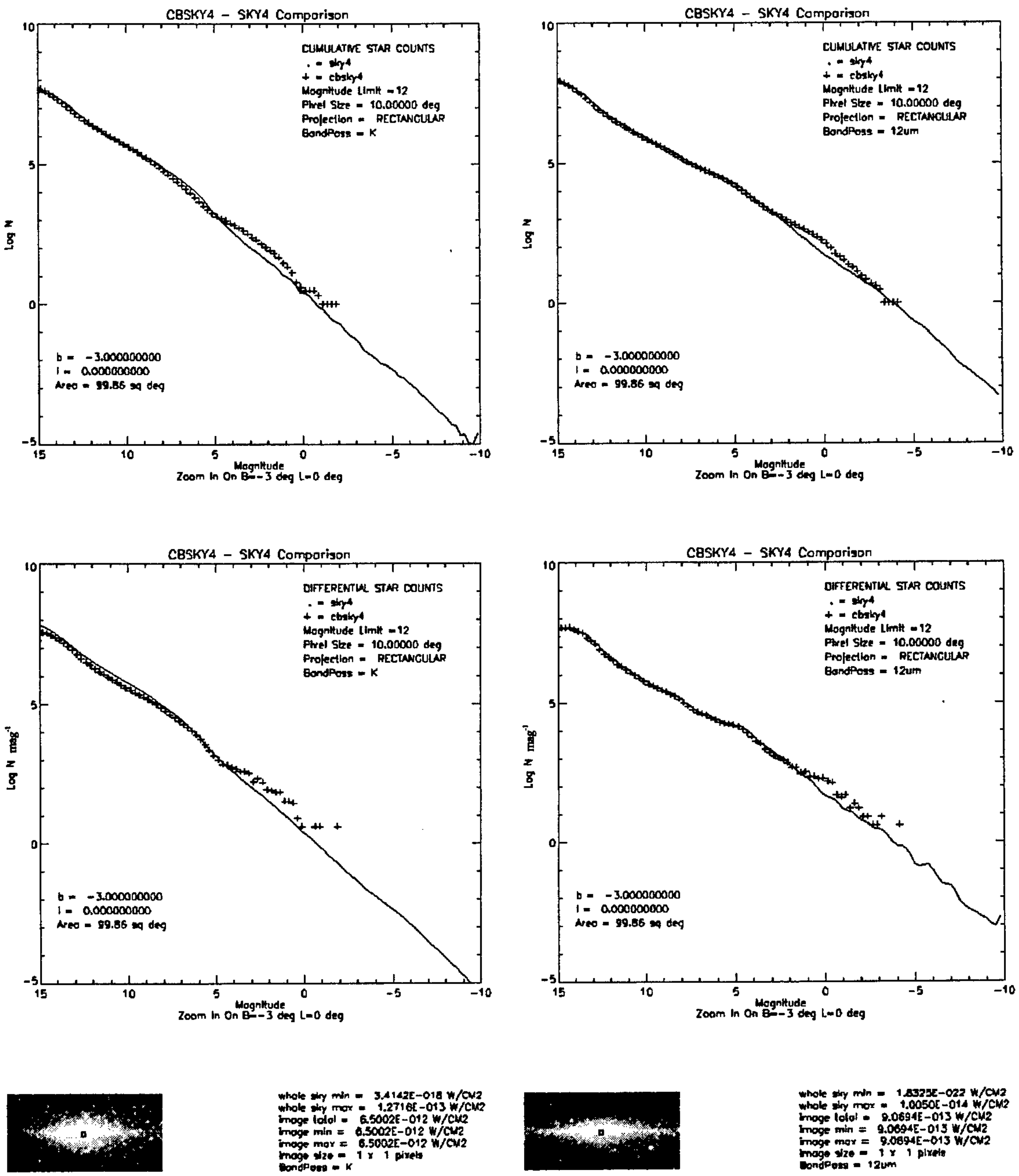


Figure C.1: SKY4 - CBSKY4 comparison for 10.0 deg around l =3.0, b = 0.0.

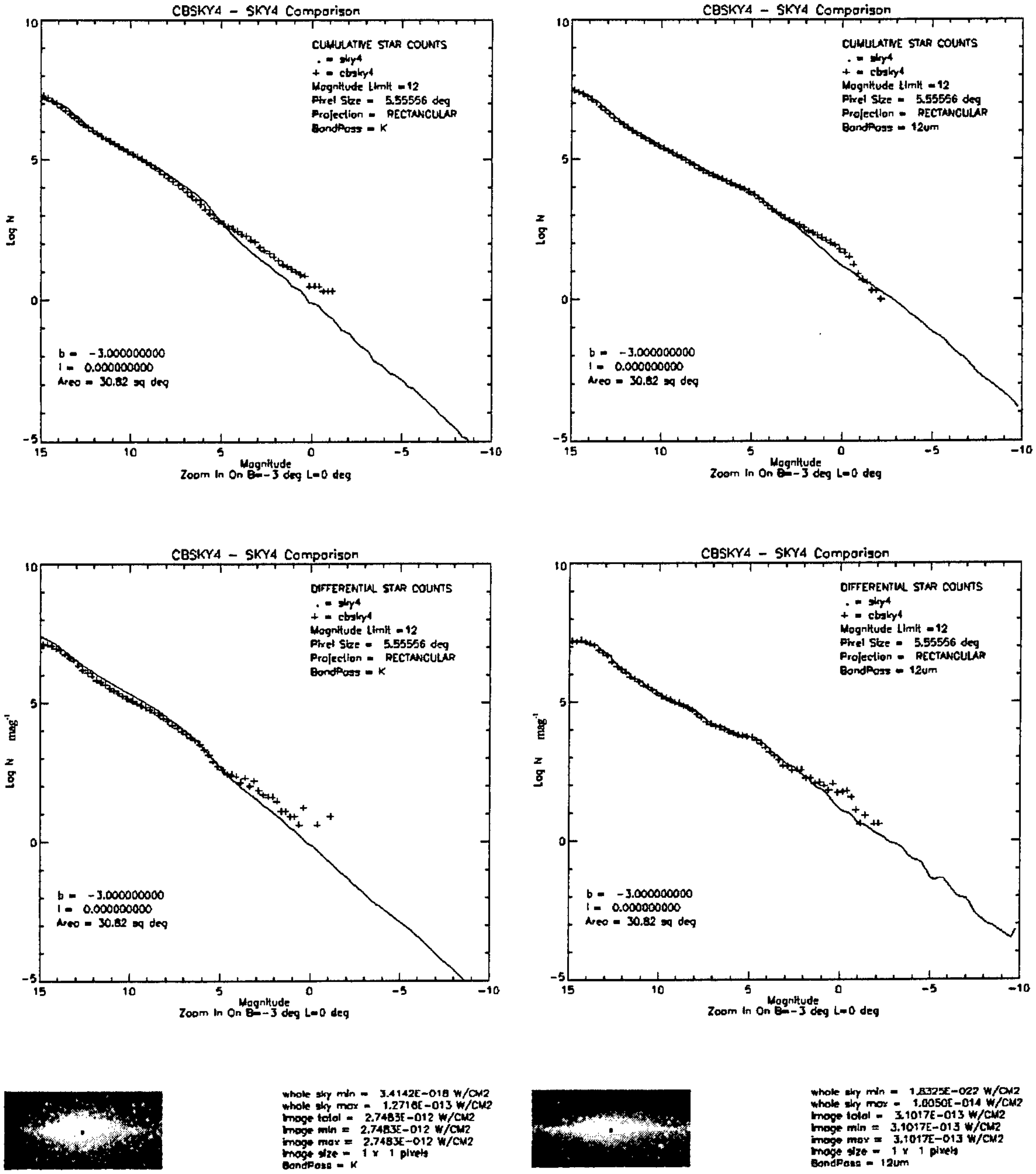


Figure C.2: SKY4 - CBSKY4 comparison for 5.56 deg around l =3.0, b = 0.0.

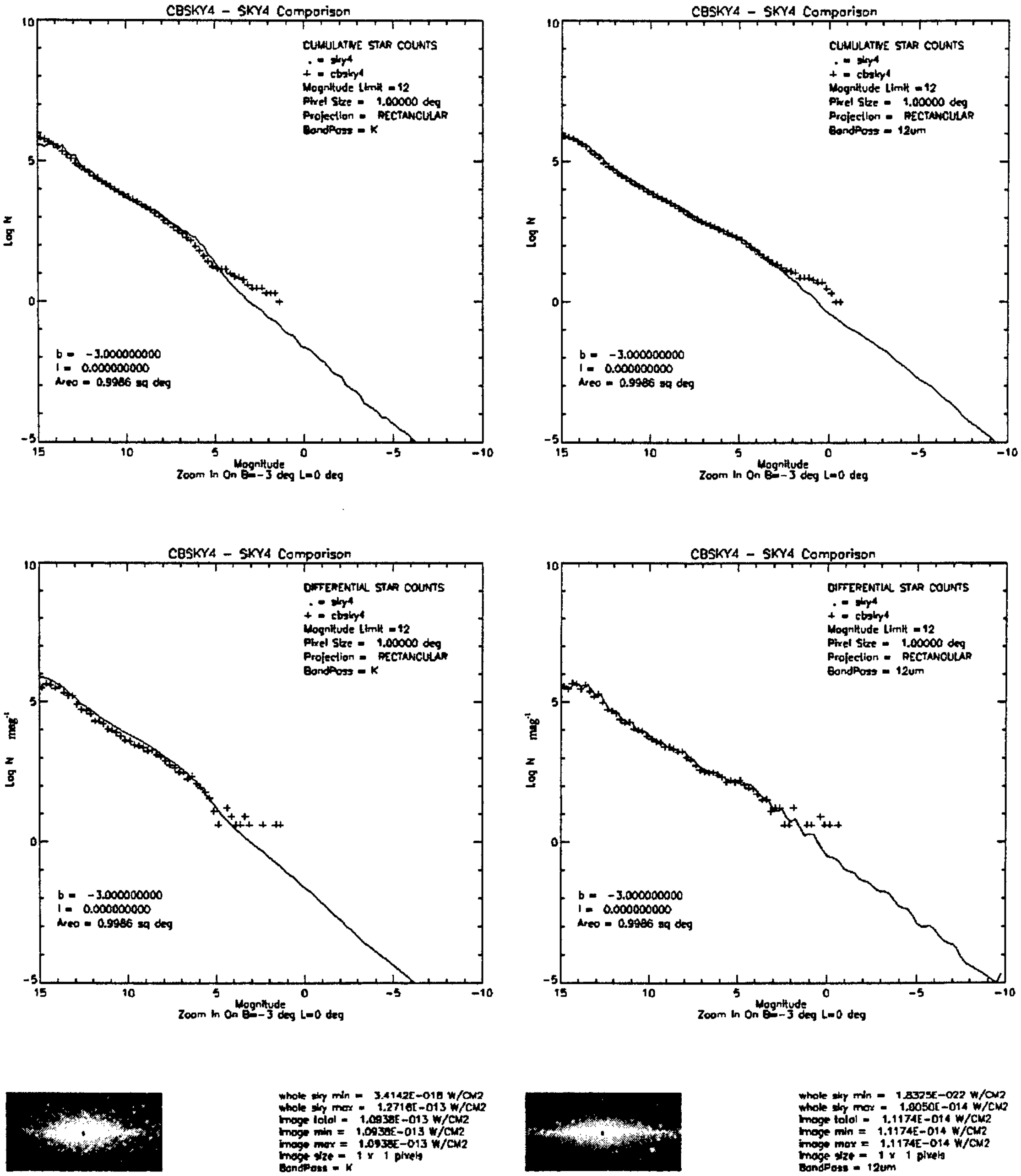


Figure C.3: SKY4 - CBSKY4 comparison for 1.0 deg around l =3.0, b = 0.0.

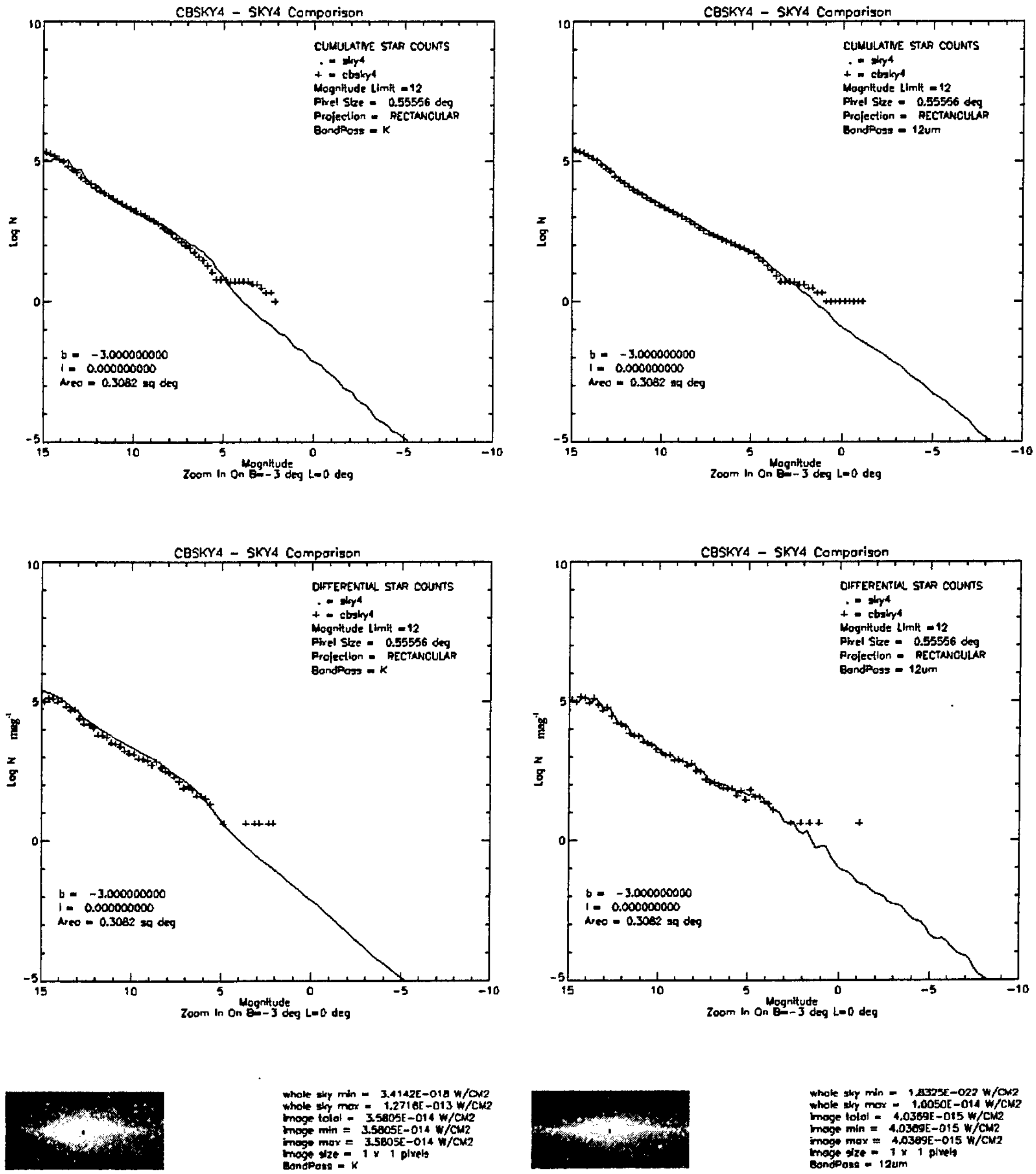


Figure C.4: SKY4 - CBSKY4 comparison for 0.556 deg around l =3.0, b = 0.0.

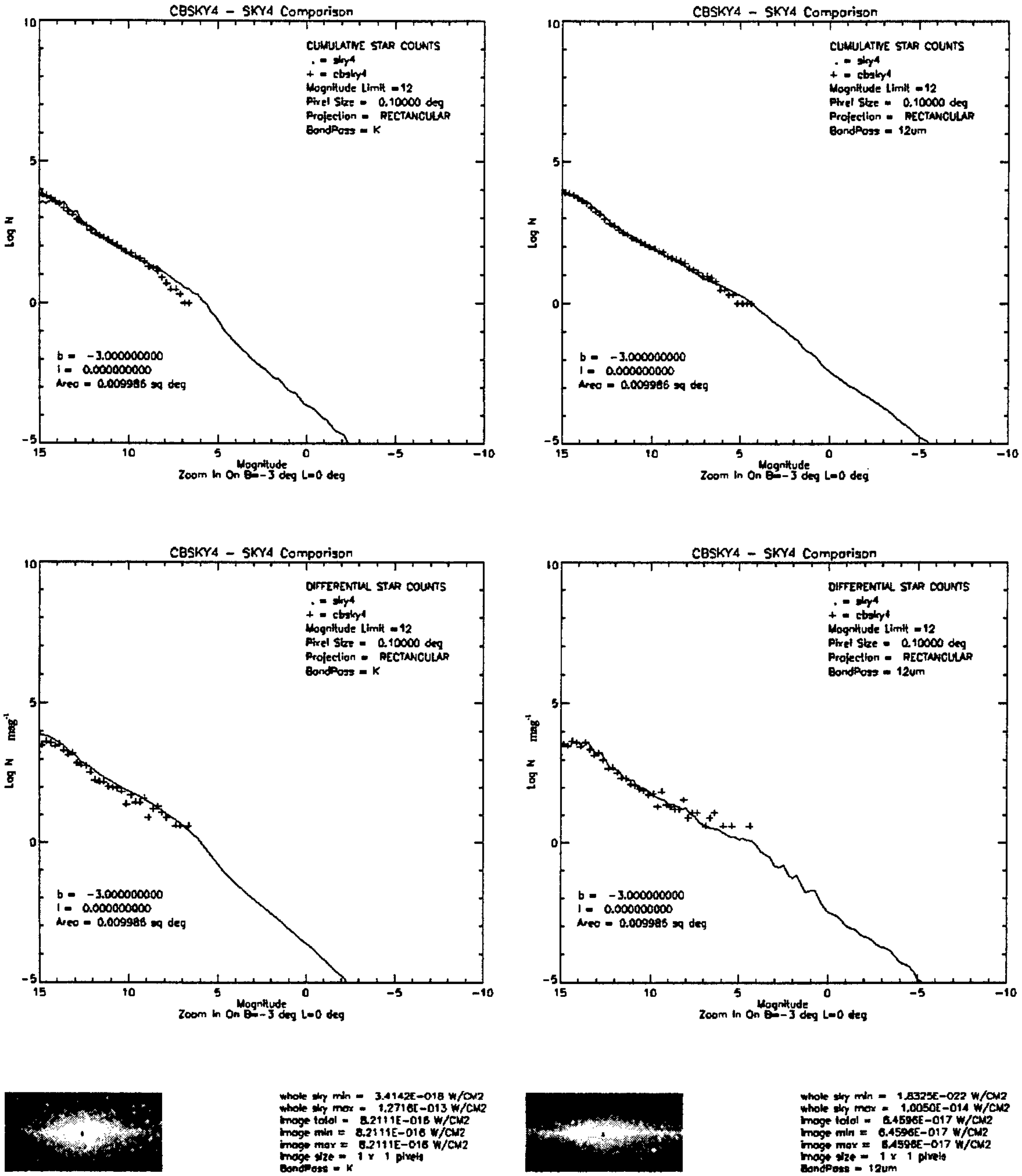


Figure C.5: SKY4 - CBSKY4 comparison for 0.1 deg around l =3.0, b = 0.0.

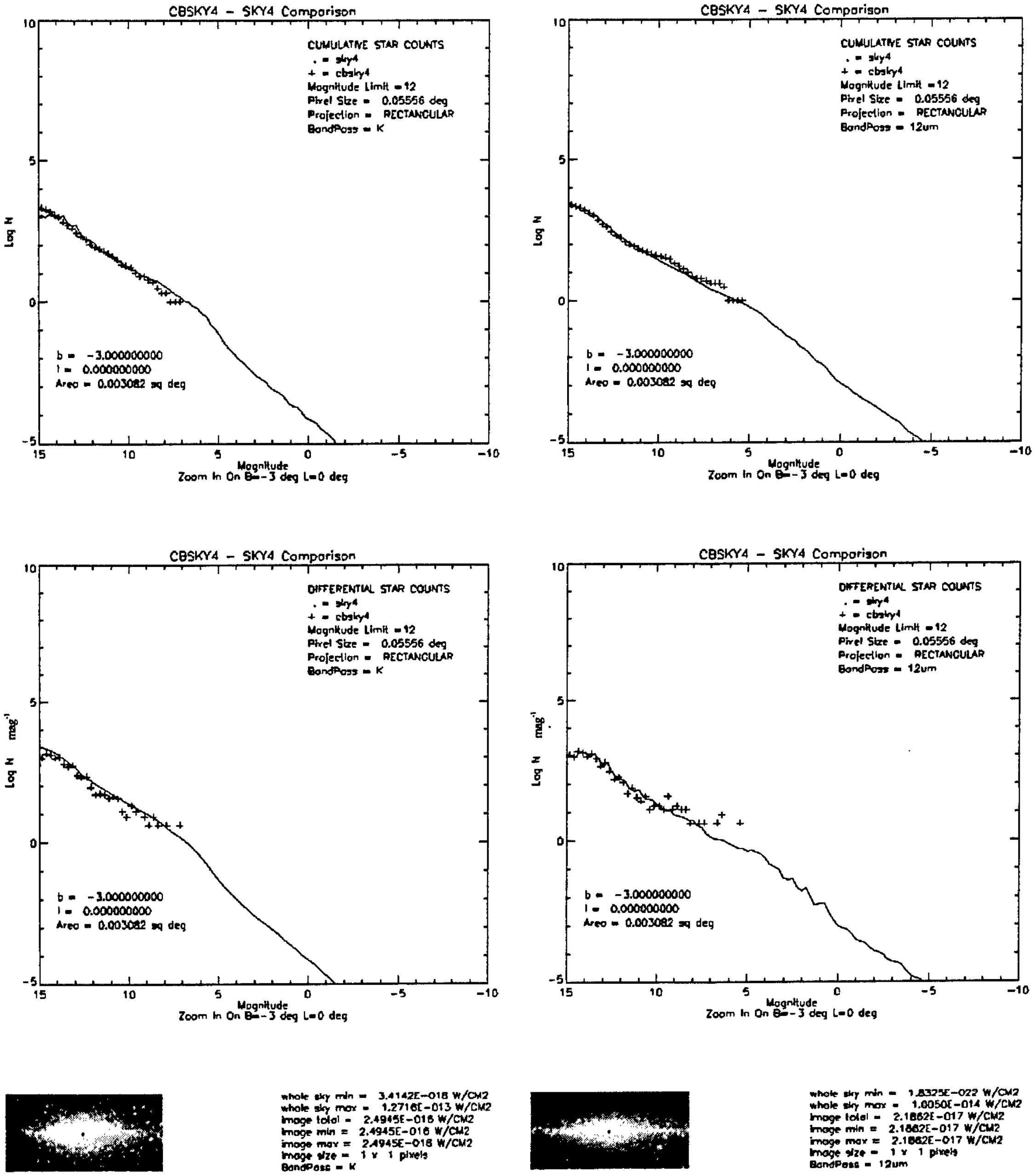


Figure C.6: SKY4 - CBSKY4 comparison for 0.0556 deg around l =3.0, b = 0.0.

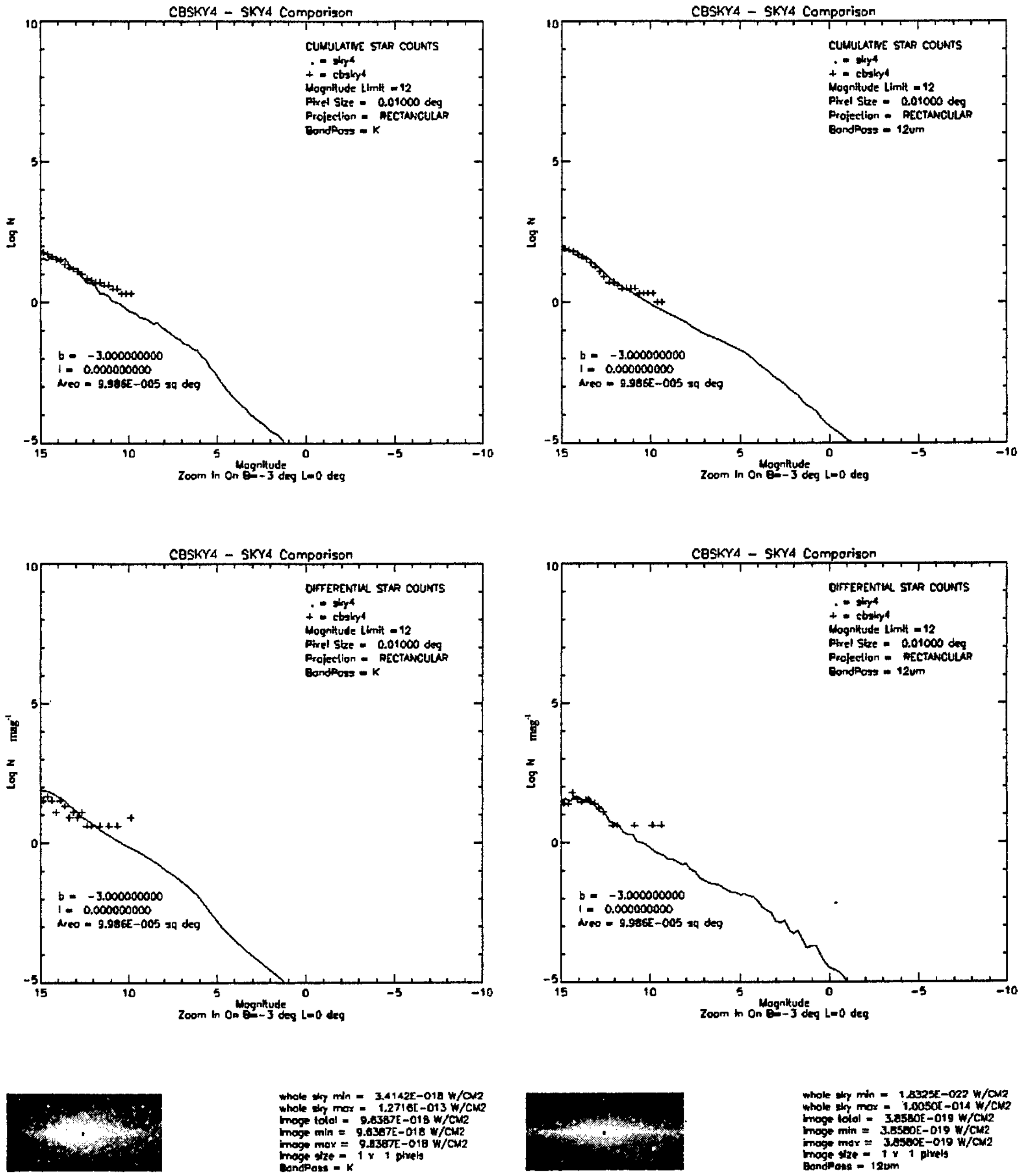


Figure C.7: SKY4 - CBSKY4 comparison for 0.01 deg around l =3.0, b = 0.0.

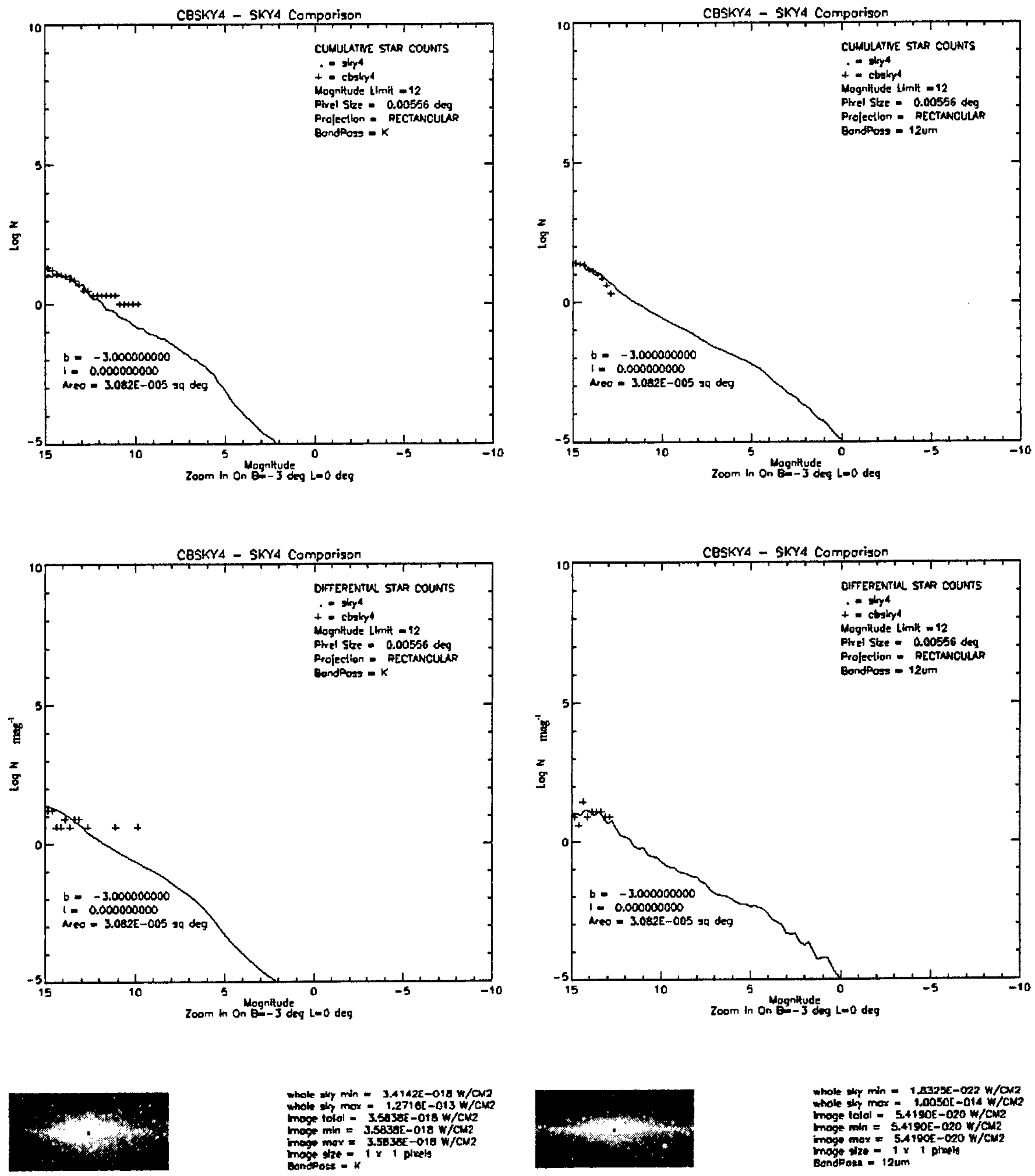


Figure C.8: SKY4 - CBSKY4 comparison for 0.00556 deg around l =3.0, b = 0.0.

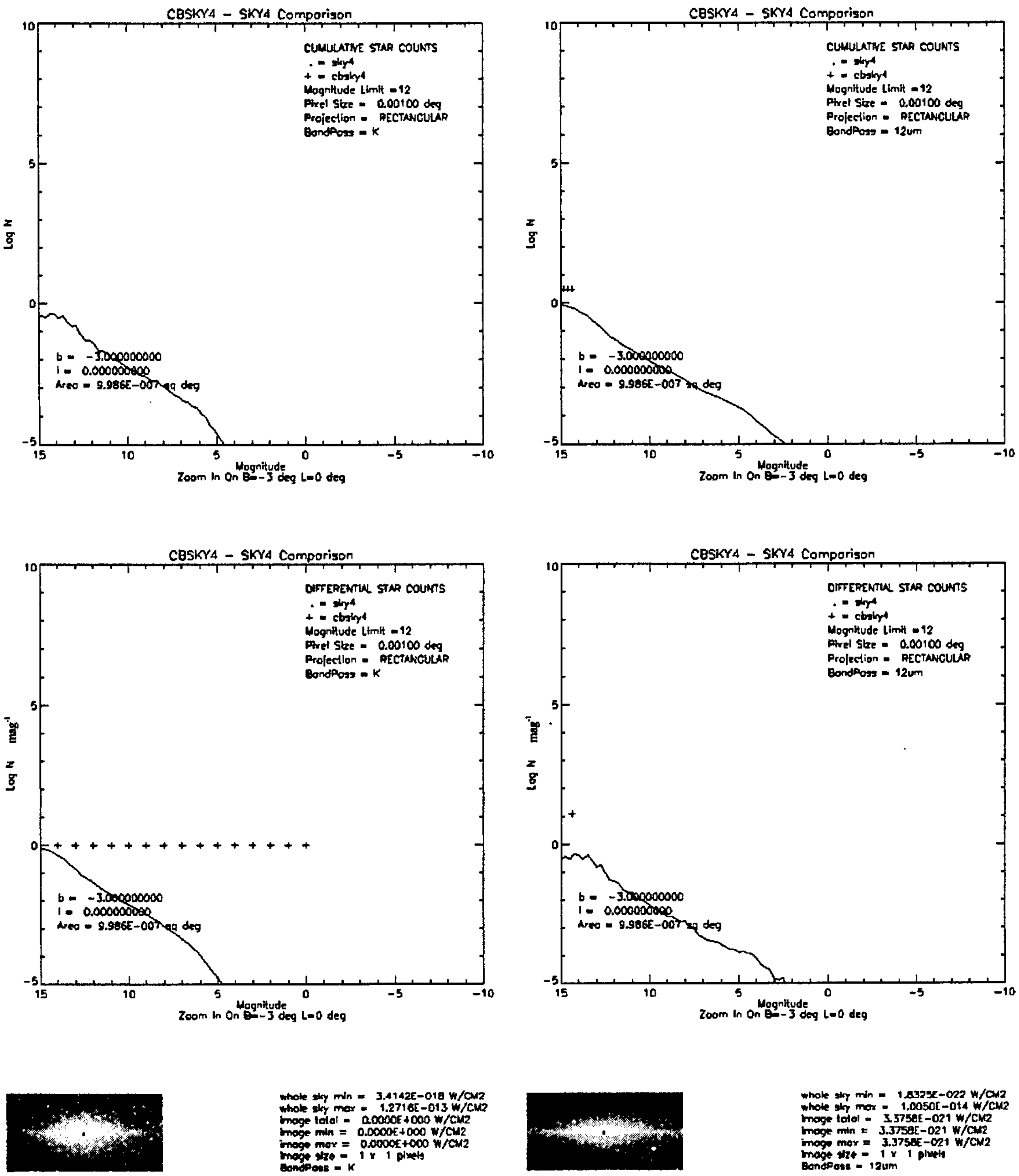


Figure C.9: SKY4 - CBSKY4 comparison for 0.001 deg around l =3.0, b = 0.0.

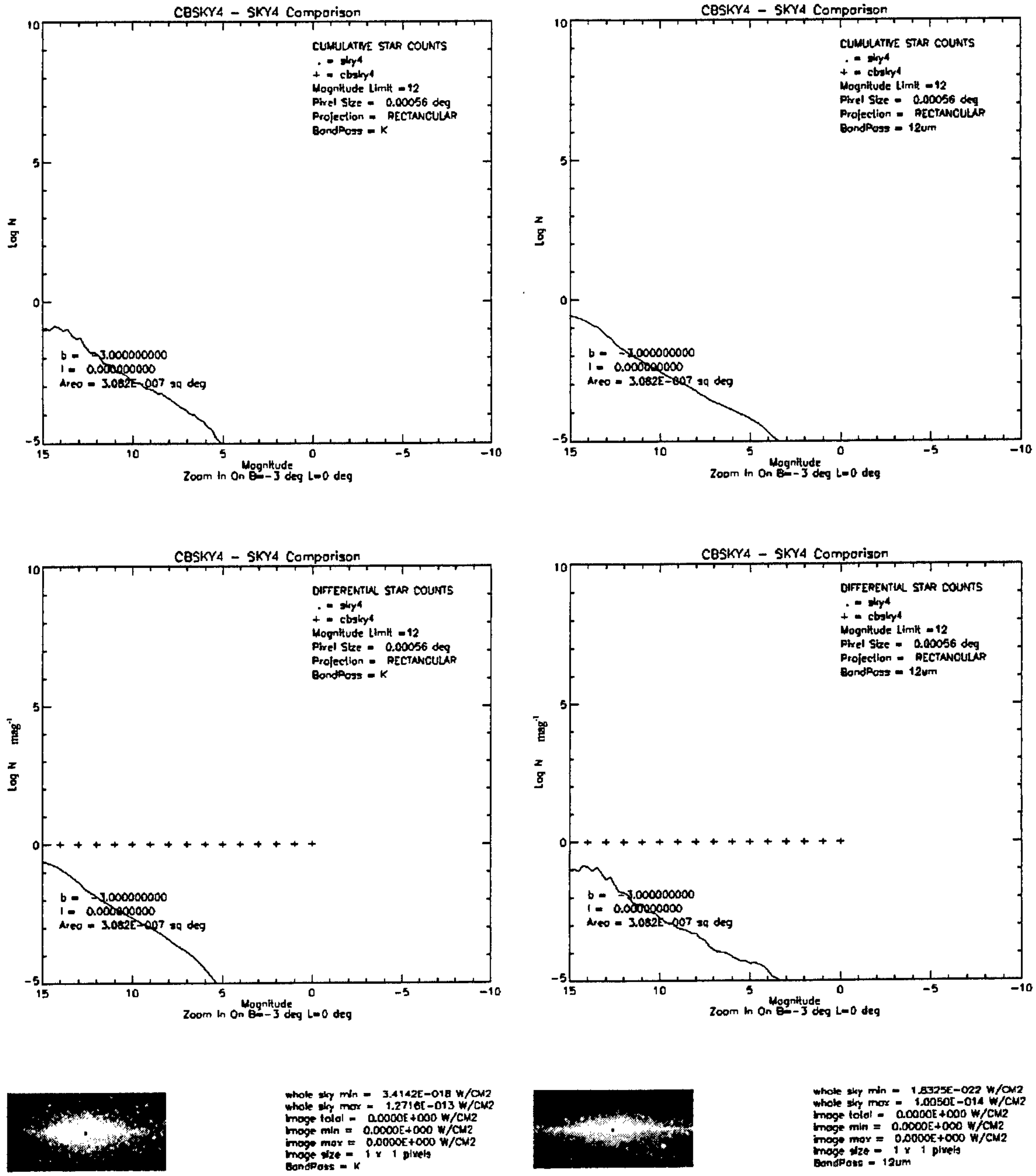


Figure C.10: SKY4 - CBSKY4 comparison for 0.000556 deg around l =3.0, b = 0.0.

Appendix C.2

The region around l = 0 deg, b = 0 deg with the following pixel sizes (degrees) for Band K and 12μm:

10.0	5.56	1.0	0.556	0.10
0.0556	0.01	0.00556	0.001	0.000556

Table C.4: Interactive inputs used for the SKY4 runs around l =0.0, b = 0.0.

Value Used	Description
y	Keep solar displacement of 15 pc N of plane.
y	Integrate over area.
see Table C.5	Limits of galactic latitude in degrees.
see Table C.5	Limits of galactic longitude in degrees.
see Table C.5	Incremental steps in latitude and longitude (in degrees).
n	No, don't print bright magnitudes-by-components information.
n	No, don't print surface brightness data.
n	No, don't bring back colors.
y	Yes, create LogN vs. LogS plots.
5 and 7	Use the pre-defined "12UM" bandpass (value = 7) and use the pre-defined "K" bandpass (value = 5) [This value is regressed upon, there are two separate SKY4 runs.]
y and n	Yes, plot the cumulative LogN on the y-axis, and no, plot the differential LogN on the y-axis. [This value is regressed upon, there are two separate SKY4 runs.]
y	Plot Magnitudes on x-axis.
n	No, don't plot observed points.

Table C.5: Region Definitions around l =0.0, b = 0.0.

x_FOV (Deg)	**Initial Latitude (Deg)**	**Final Latitude (Deg)**	**Initial Longitude (Deg)**	**Final Longitude (Deg)**	**Step Latitude (Deg)**	**Step Longitude (Deg)**
1.00E+01	-5.00E+00	5.00E+00	-5.00E+00	5.00E+00	1.00E+00	1.00E+00
5.56E+00	-2.78E+00	2.78E+00	-2.78E+00	2.78E+00	5.56E-01	5.56E-01
1.00E+00	-5.00E-01	5.00E-01	-5.00E-01	5.00E-01	1.00E-01	1.00E-01
5.56E-01	-2.78E-01	2.78E-01	-2.78E-01	2.78E-01	5.56E-02	5.56E-02
1.00E-01	-5.00E-02	5.00E-02	-5.00E-02	5.00E-02	1.00E-02	1.00E-02
5.56E-02	-2.78E-02	2.78E-02	-2.78E-02	2.78E-02	5.56E-03	5.56E-03
1.00E-02	-5.00E-03	5.00E-03	-5.00E-03	5.00E-03	1.00E-03	1.00E-03
5.56E-03	-2.78E-03	2.78E-03	-2.78E-03	2.78E-03	5.56E-04	5.56E-04
1.00E-03	-5.00E-04	5.00E-04	-5.00E-04	5.00E-04	1.00E-04	1.00E-04
5.56E-04	-2.78E-04	2.78E-04	-2.78E-04	2.78E-04	5.56E-05	5.56E-05

Table C.6: CBSKY4 Inputs around l =0.0, b = 0.0.

```
[Path]
architecture = DOS
path=\cbsd4\dataout\cbsky4\ZoomIn_B0_L0_12um\
code_path=\cbsd4\cbsd\cbsky4
data_path=\cbsd4\cbsd\sky4data
verbose = YES

[cbsky4]
log_output = ZoomIn_P1.log
map = NO
real_stars = NO
statistical_stars = YES
clouds = YES
magnitude_limit = 15
seed = 346
method = CENTER
catalog = NO
catalog_limit = 10
nodesfile = NODE_IAH.DAT
elementsfile = ELEM_IAH.DAT
extinction = YES
count_statistics = YES
x-axis = MAGNITUDES
y-axis = Differential
errmap = NO
extmap = NO
spectral_type = 0

[convolution]
convolution = NO
point_spread_function = gaussian
psf_half_width = 1.01
```

```
[Image]
Image = YES
output_format = FITS
image_type=4-BYTE REAL
image_projection = RECTANGULAR
x_column_pixels = 1
y_row_pixels = 1
pixel_size = 10.0000000000000
image_center_longitude_degrees
= 0.000000000
image_center_latitude =
0.000000000
units = W/CM2

[Positional]
observer_altitude = 0.0
observer_geographic_latitude =
0.0
observer_geographic_longitude =
0.0
Reference_Frame = B1950
coordinate_system = galactic
positions = apparent
Reference_system = geocentric

[spectral]
start_wavelength =12um
end_wavelength=12um

[Time]
observation_date=2 2 2000
observation_time=0 0 0.0
```

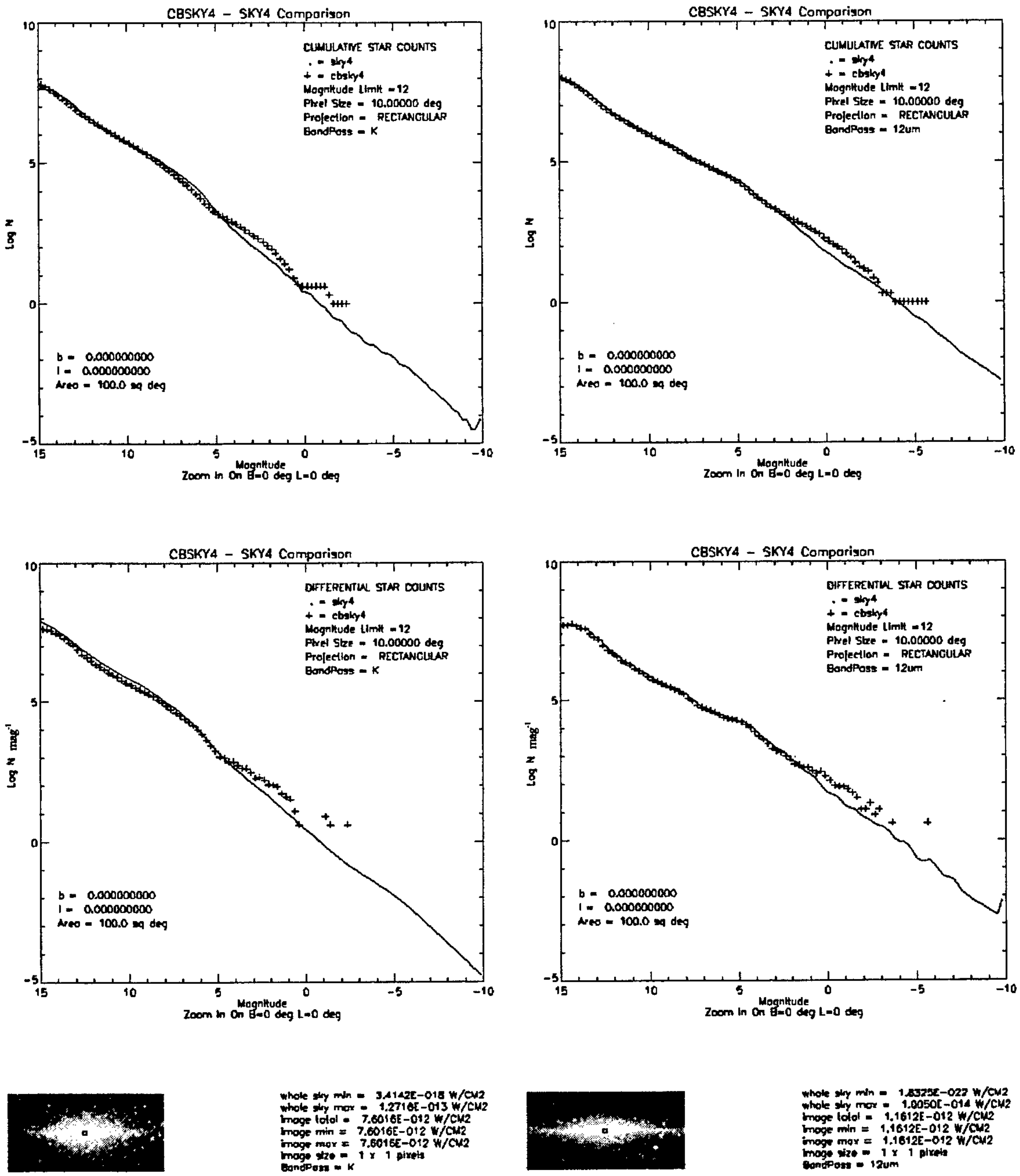


Figure C.11: SKY4 - CBSKY4 comparison for 10.0 deg around l =0.0, b = 0.0.

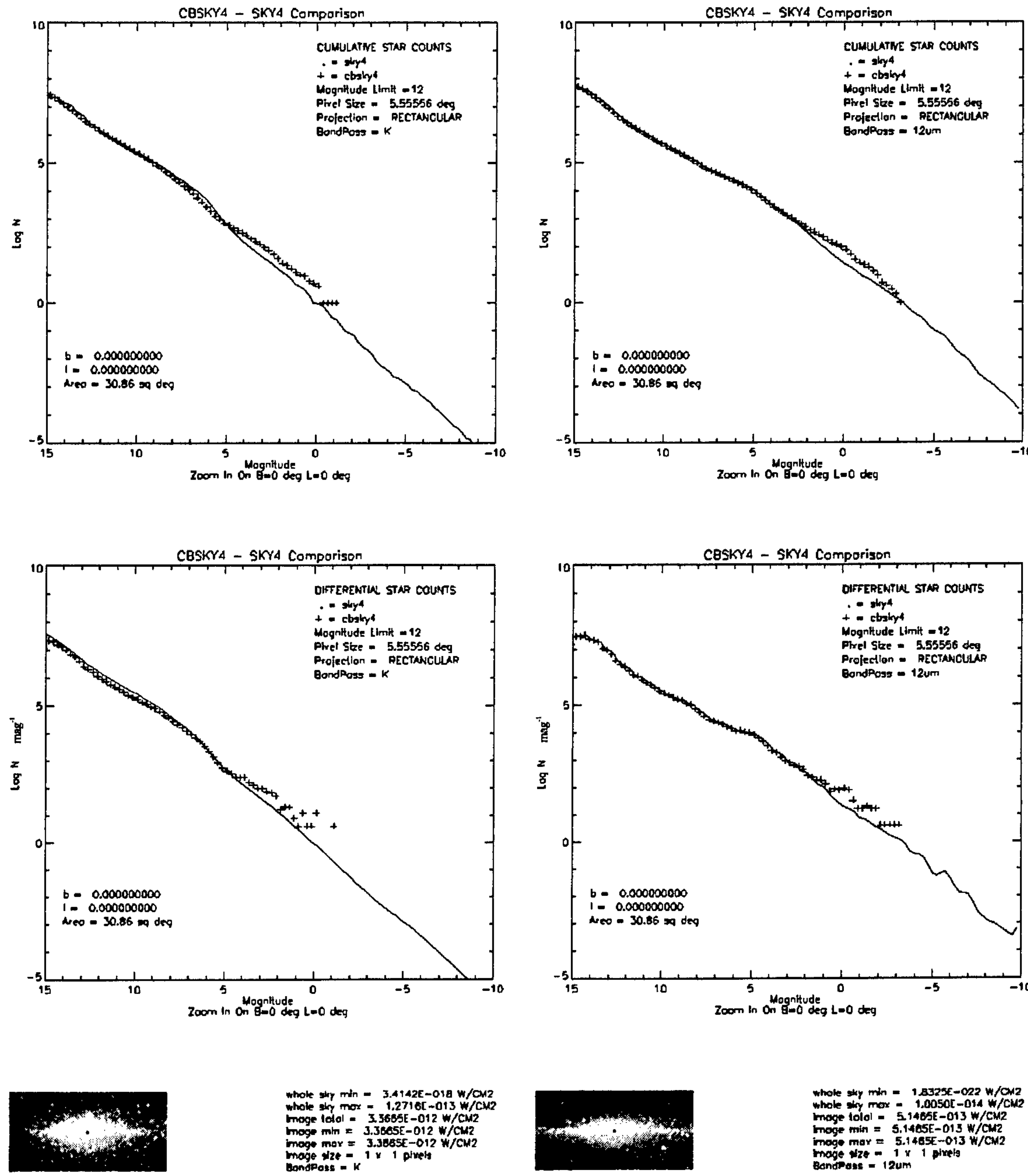


Figure C.12: SKY4 - CBSKY4 comparison for 5.56 deg around l =0.0, b = 0.0.

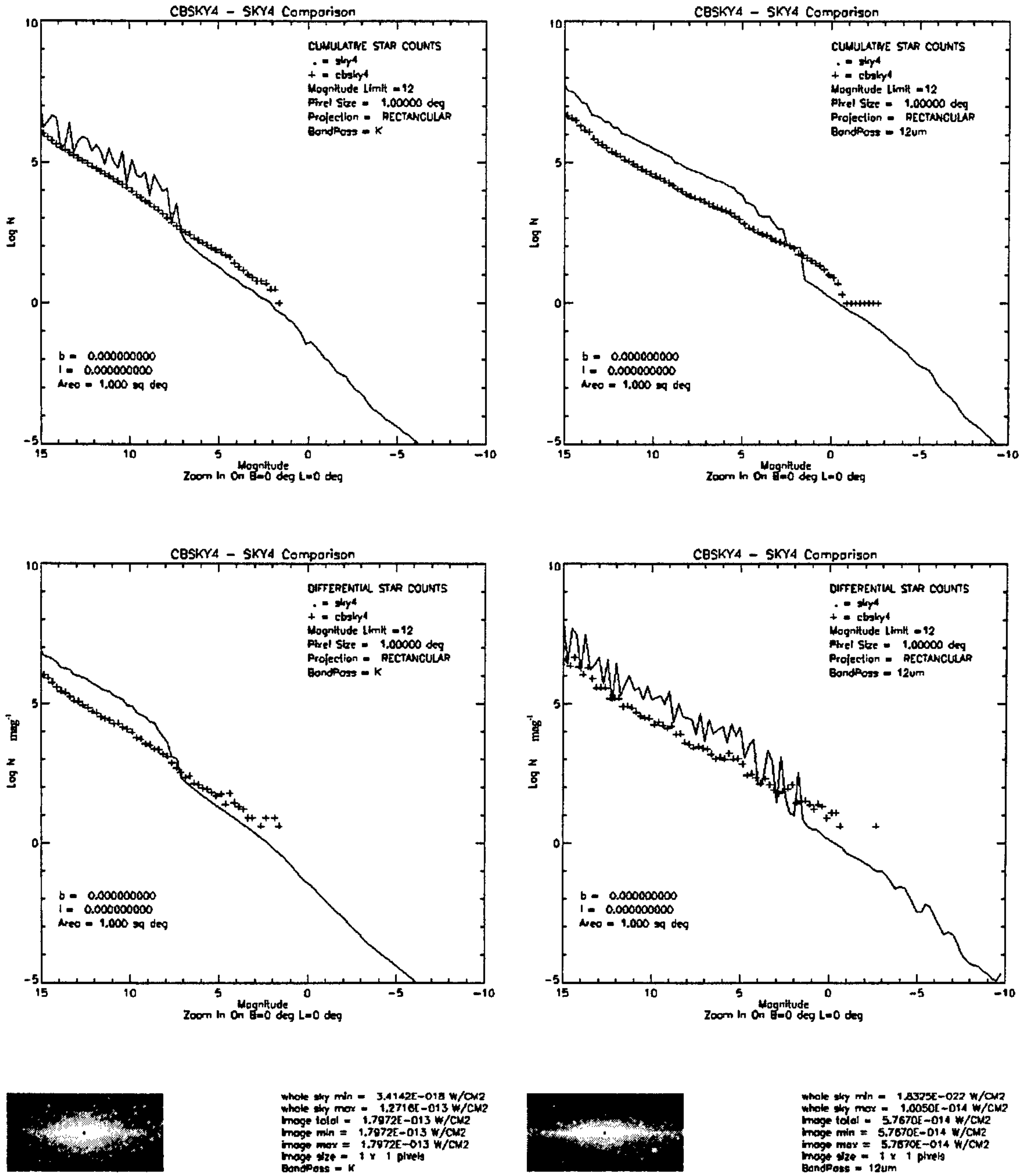


Figure C.13: SKY4 - CBSKY4 comparison for 1.0 deg around l =0.0, b = 0.0.

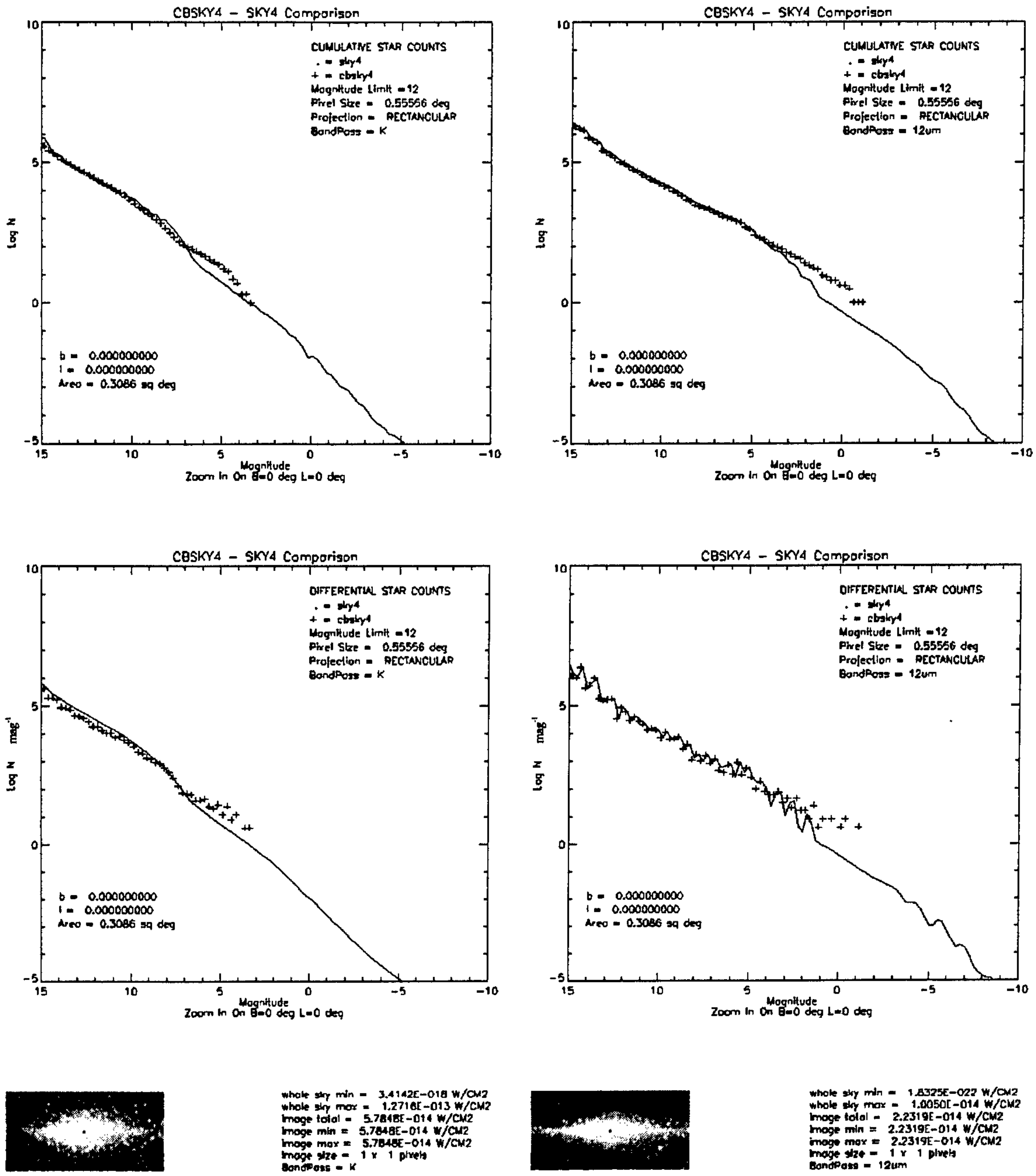


Figure C.14: SKY4 - CBSKY4 comparison for 0.556 deg around l =0.0, b = 0.0.

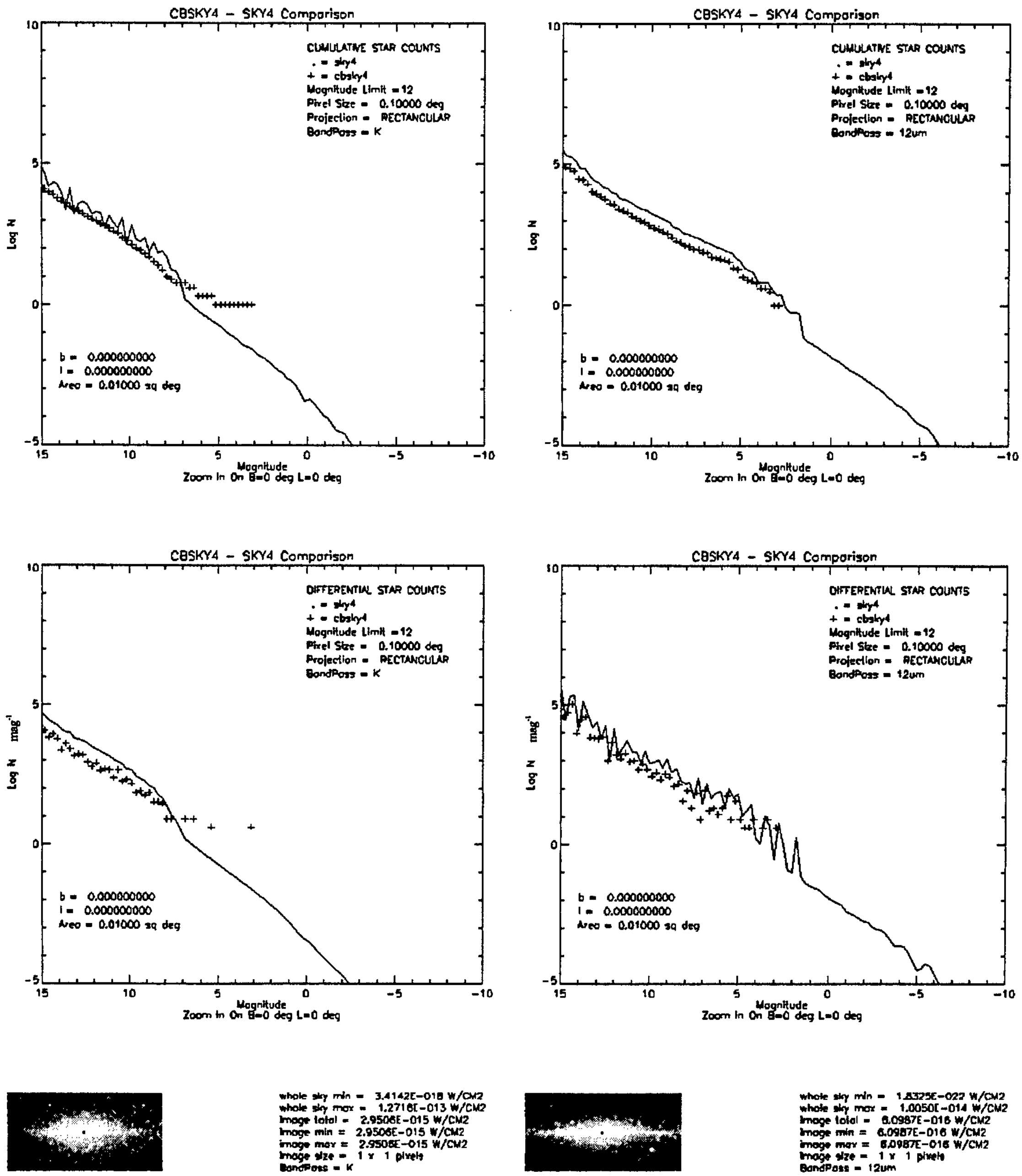
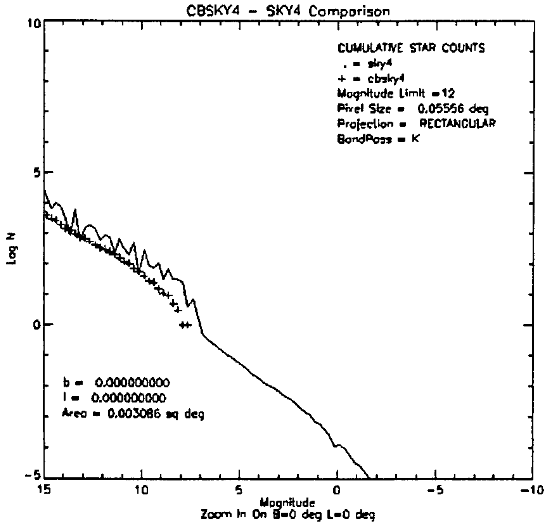
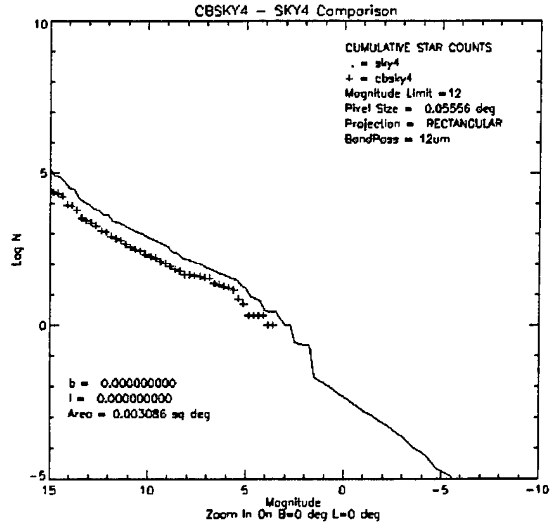
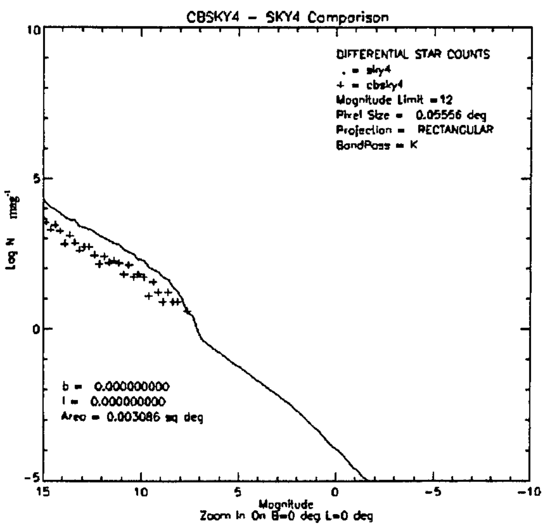
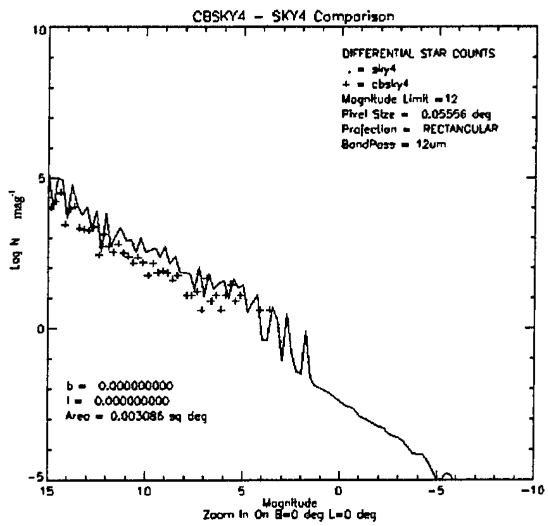


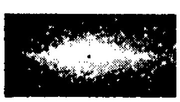
Figure C.15: SKY4 - CBSKY4 comparison for 0.1 deg around l =0.0, b = 0.0.



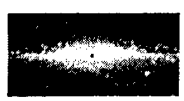






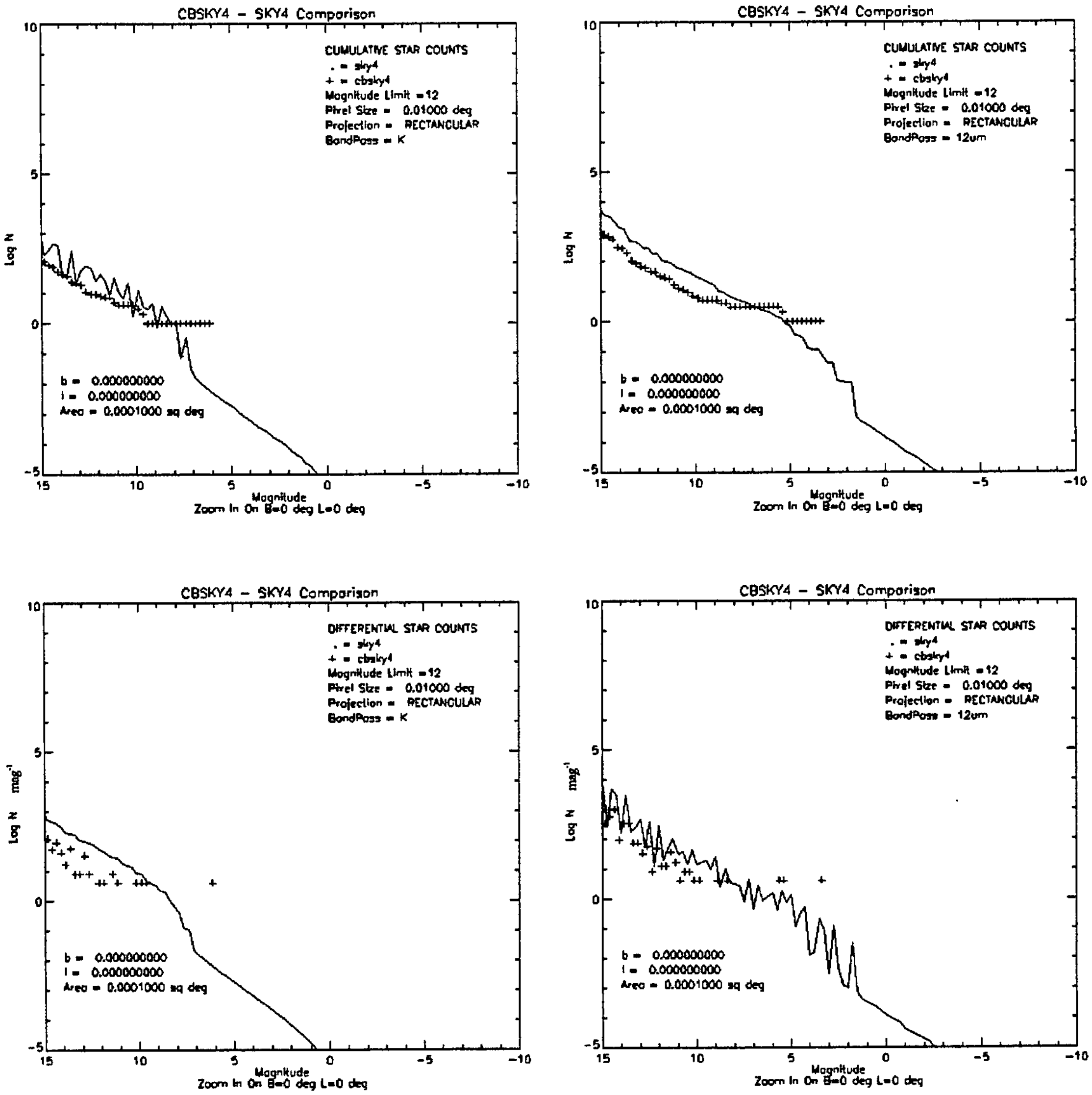


whole sky min = 3.4142E-018 W/CM2
whole sky max = 1.2718E-013 W/CM2
Image total = 5.3642E-016 W/CM2
Image min = 5.3642E-016 W/CM2
image max = 5.3842E-016 W/CM2
Image size = 1 x 1 pixels
BandPass = K



whole sky min = 1.8325E-022 W/CM2
whole sky max = 1.0050E-014 W/CM2
Image total = 1.9358E-016 W/CM2
image min = 1.9358E-016 W/CM2
image max = 1.9358E-016 W/CM2
Image size = 1 x 1 pixels
BandPass = 12um

Figure C.16: SKY4 - CBSKY4 comparison for 0.0556 deg around l =0.0, b = 0.0.



whole sky min = 3.4142E-018 W/CM2
whole sky max = 1.2716E-013 W/CM2
image total = 7.7017E-017 W/CM2
image min = 7.7017E-017 W/CM2
image max = 7.7017E-017 W/CM2
image size = 1 x 1 pixels
BandPass = K

whole sky min = 1.8325E-022 W/CM2
whole sky max = 1.0050E-014 W/CM2
image total = 3.5200E-017 W/CM2
image min = 3.5200E-017 W/CM2
image max = 3.5200E-017 W/CM2
image size = 1 x 1 pixels
BandPass = 12um

Figure C.17: SKY4 - CBSKY4 comparison for 0.01 deg around l =0.0, b = 0.0.

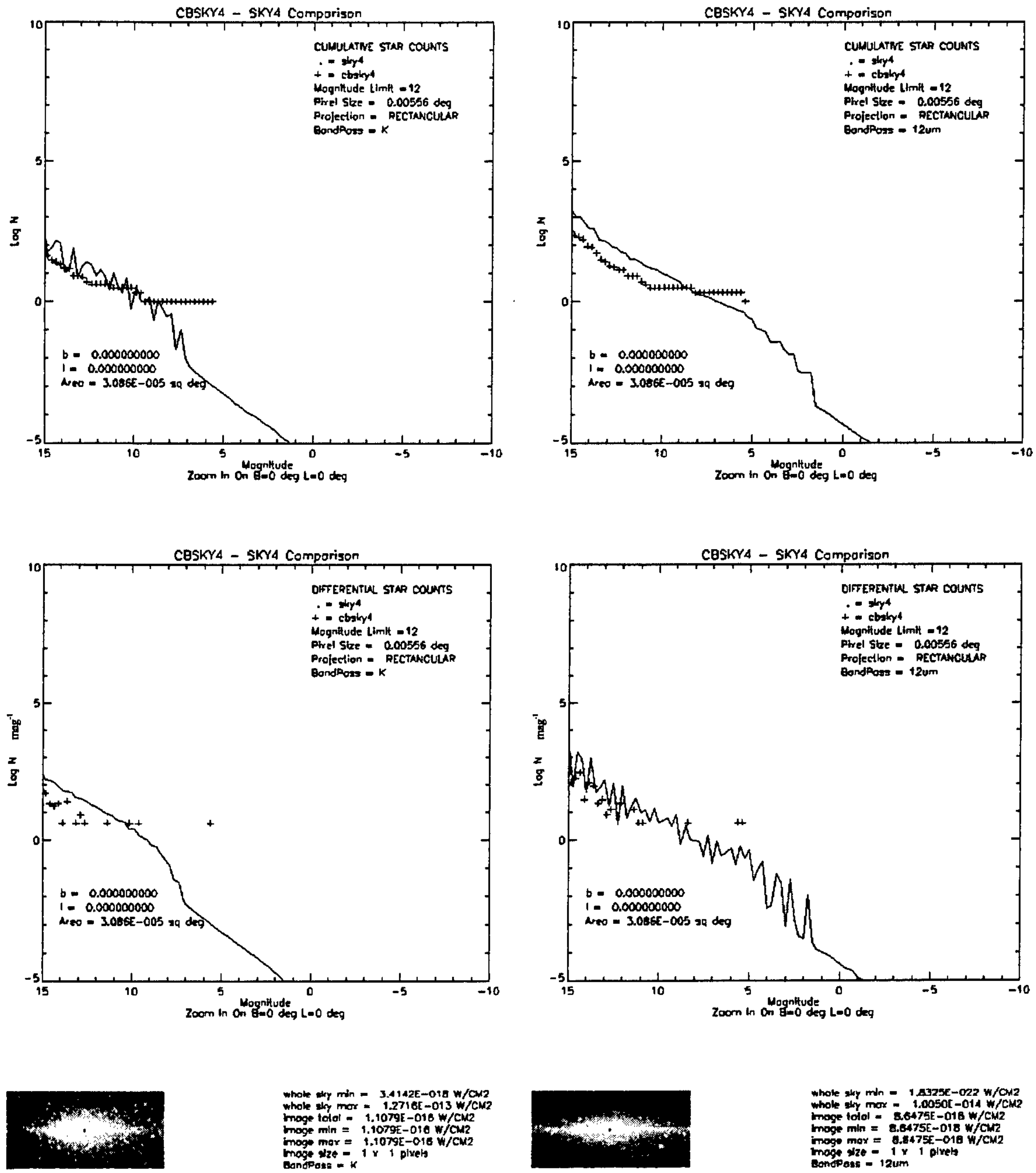


Figure C.18: SKY4 - CBSKY4 comparison for 0.00556 deg around l =0.0, b = 0.0.

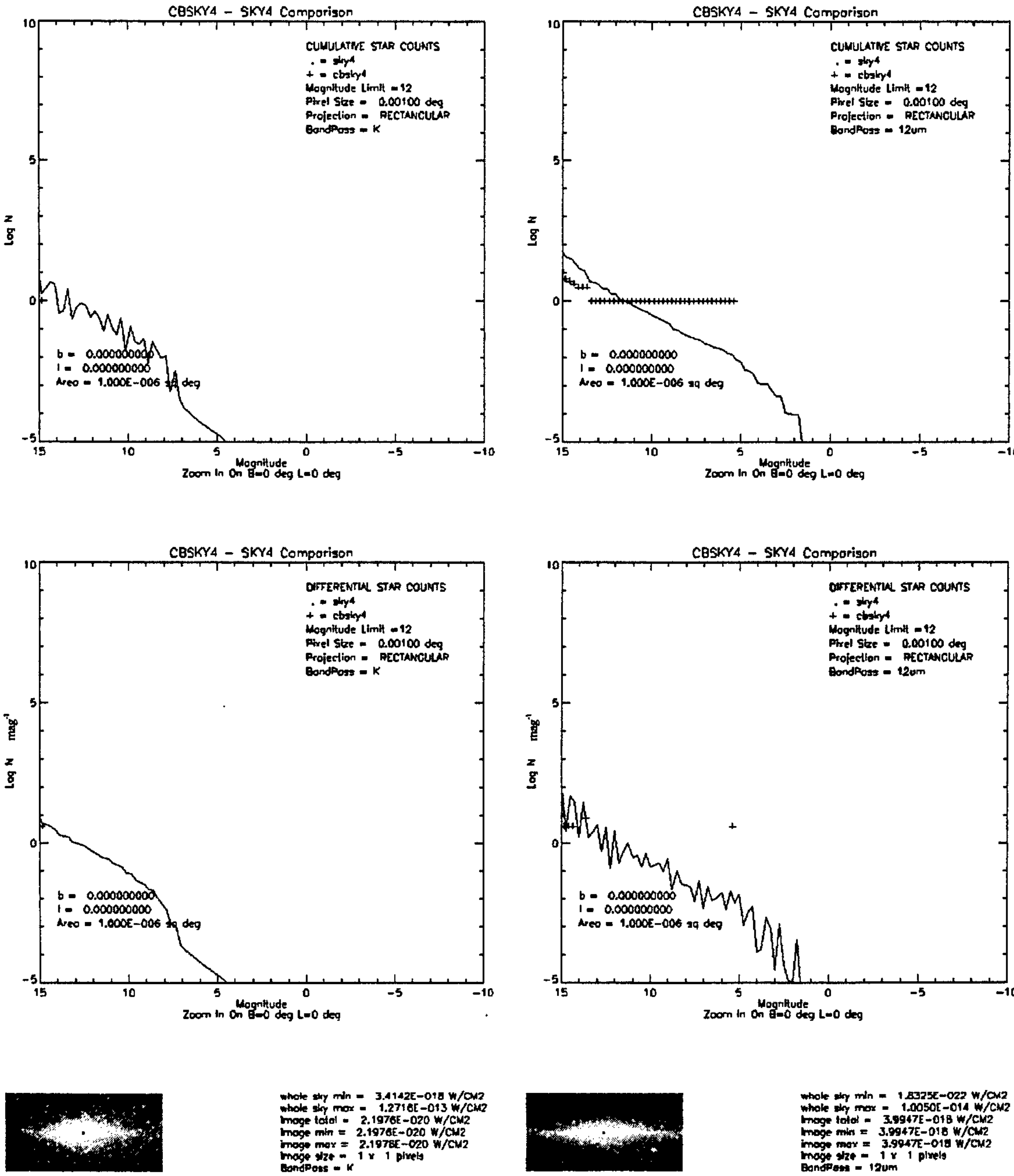


Figure C.19: SKY4 - CBSKY4 comparison for 0.001 deg around l =0.0, b = 0.0.

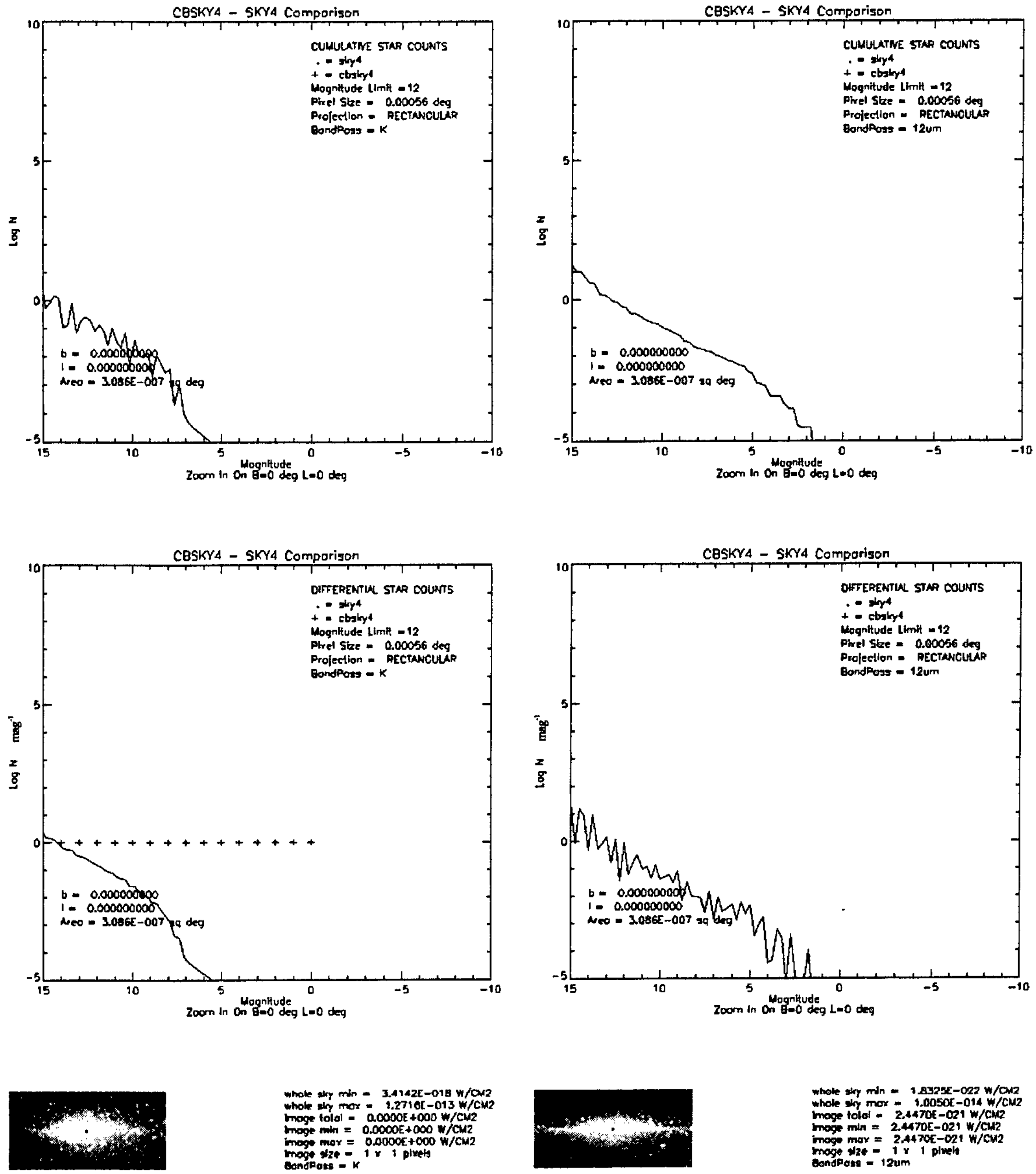


Figure C.20: SKY4 - CBSKY4 comparison for 0.000556 deg around l =0.0, b = 0.0.

Appendix C.3

The region around l = 3 deg, b = 0 deg with the following pixel sizes (degrees) for Band K and 12μm:

10.0	5.56	1.0	0.556	0.10
0.0556	0.01	0.00556	0.001	0.000556

Table C.7: Interactive inputs used for the SKY4 runs around l =3.0, b = 0.0.

Value Used	Description
y	Keep solar displacement of 15 pc N of plane.
y	Integrate over area.
see Table C.8	Limits of galactic latitude in degrees.
see Table C.8	Limits of galactic longitude in degrees.
see Table C.8	Incremental steps in latitude and longitude (in degrees).
n	No, don't print bright magnitudes-by-components information.
n	No, don't print surface brightness data.
n	No, don't bring back colors.
y	Yes, create LogN vs. LogS plots.
5 and 7	Use the pre-defined "12UM" bandpass (value = 7) and use the pre-defined "K" bandpass (value = 5) [This value is regressed upon, there are two separate SKY4 runs.]
y and n	Yes, plot the cumulative LogN on the y-axis, and no, plot the differential LogN on the y-axis. [This value is regressed upon, there are two separate SKY4 runs.]
y	Plot Magnitudes on x-axis.
n	No, don't plot observed points.

Table C.8: Region Definitions around l =3.0, b = 0.0.

x_FOV (Deg)	Initial Latitude (Deg)	Final Latitude (Deg)	Initial Longitude (Deg)	Final Longitude (Deg)	Step Latitude (Deg)	Step Longitude (Deg)
1.00E+01	-2.00E+00	8.00E+00	-5.00E+00	5.00E+00	1.00E+00	1.00E+00
5.56E+00	+2.22E-01	5.78E+00	-2.78E+00	2.78E+00	5.56E-01	5.56E-01
1.00E+00	+2.50E+00	3.50E+00	-5.00E-01	5.00E-01	1.00E-01	1.00E-01
5.56E-01	+2.72E+00	3.28E+00	-2.78E-01	2.78E-01	5.56E-02	5.56E-02
1.00E-01	+2.95E+00	3.05E+00	-5.00E-02	5.00E-02	1.00E-02	1.00E-02
5.56E-02	+2.97E+00	3.03E+00	-2.78E-02	2.78E-02	5.56E-03	5.56E-03
1.00E-02	+3.00E+00	3.01E+00	-5.00E-03	5.00E-03	1.00E-03	1.00E-03
5.56E-03	+3.00E+00	3.00E+00	-2.78E-03	2.78E-03	5.56E-04	5.56E-04
1.00E-03	+3.00E+00	3.00E+00	-5.00E-04	5.00E-04	1.00E-04	1.00E-04
5.56E-04	+3.00E+00	3.00E+00	-2.78E-04	2.78E-04	5.56E-05	5.56E-05

Table C.9: CBSKY4 Inputs for l =3.0, b = 0.0.

```
[Path]
architecture = DOS
path=\cbsd4\dataout\cbsky4\ZoomIn_B
3_L0_12um\
code_path=\cbsd4\cbsd\cbsky4
data_path=\cbsd4\cbsd\sky4data
verbose = YES

[cbsky4]
log_output = ZoomIn_P1.log
map = NO
real_stars = NO
statistical_stars = YES
clouds = YES
magnitude_limit = 15
seed = 346
method = CENTER
catalog = NO
catalog_limit = 10
nodesfile = NODE_IAH.DAT
elementsfile = ELEM_IAH.DAT
extinction = YES
count_statistics = YES
x-axis = MAGNITUDES
y-axis = Differential
errmap = NO
extmap = NO
spectral_type = 0

[convolution]
convolution = NO
point_spread_function = gaussian
psf_half_width = 1.01
```

```
[Image]
Image = YES
output_format = FITS
image_type=4-BYTE REAL
image_projection = RECTANGULAR
x_column_pixels = 1
y_row_pixels = 1
pixel_size = 10.0000000000000
image_center_longitude_degrees =
0.000000000
image_center_latitude = 3.000000000
units = W/CM2

[Positional]
observer_altitude = 0.0
observer_geographic_latitude = 0.0
observer_geographic_longitude = 0.0
Reference_Frame = B1950
coordinate_system = galactic
positions = apparent
Reference_system = geocentric

[spectral]
start_wavelength =12um
end_wavelength=12um

[Time]
observation_date=2 2 2000
observation_time=0 0 0.0
```

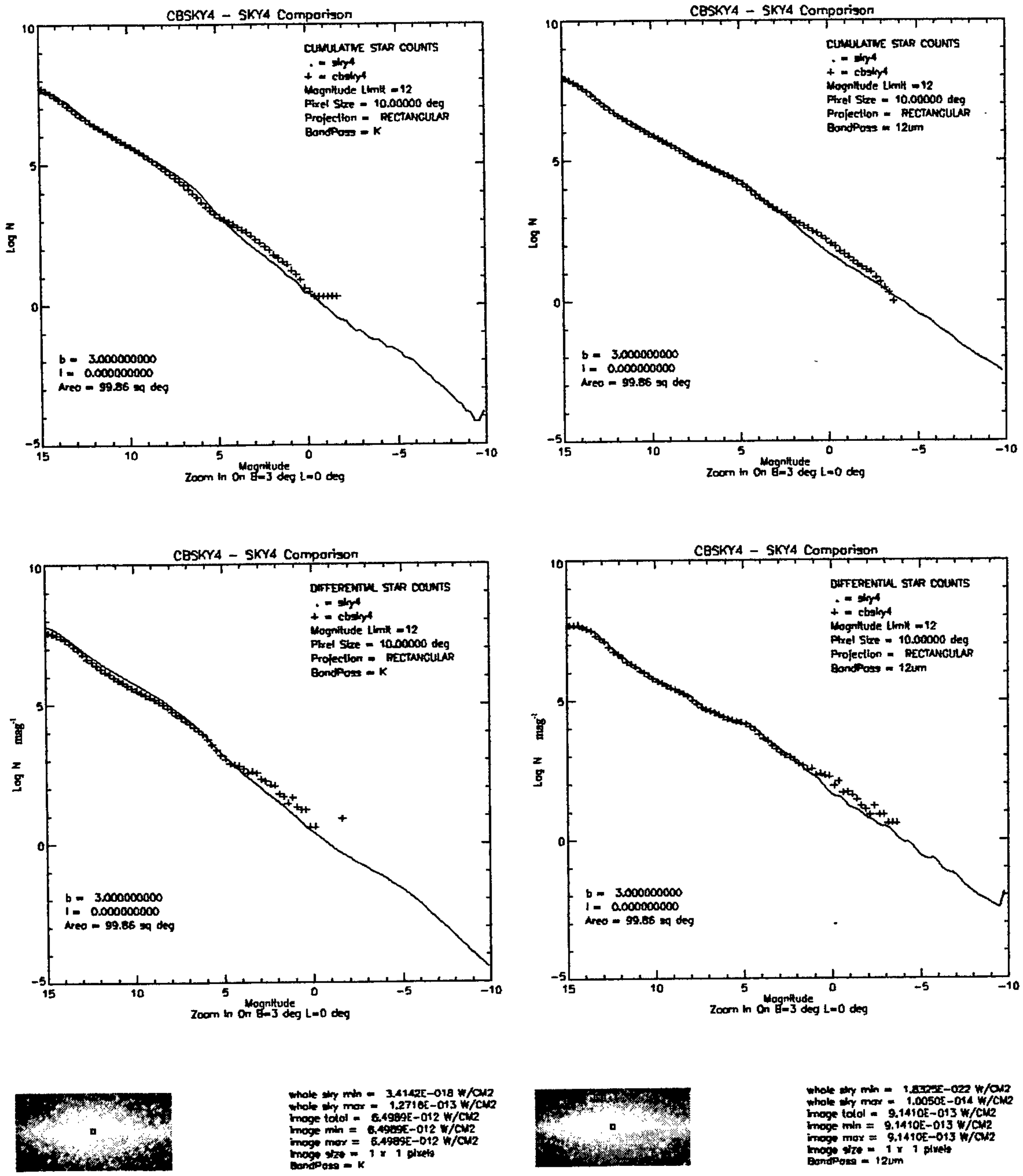


Figure C.21: SKY4 - CBSKY4 comparison for 10.0 deg around l = 3.0, b = 0.0.

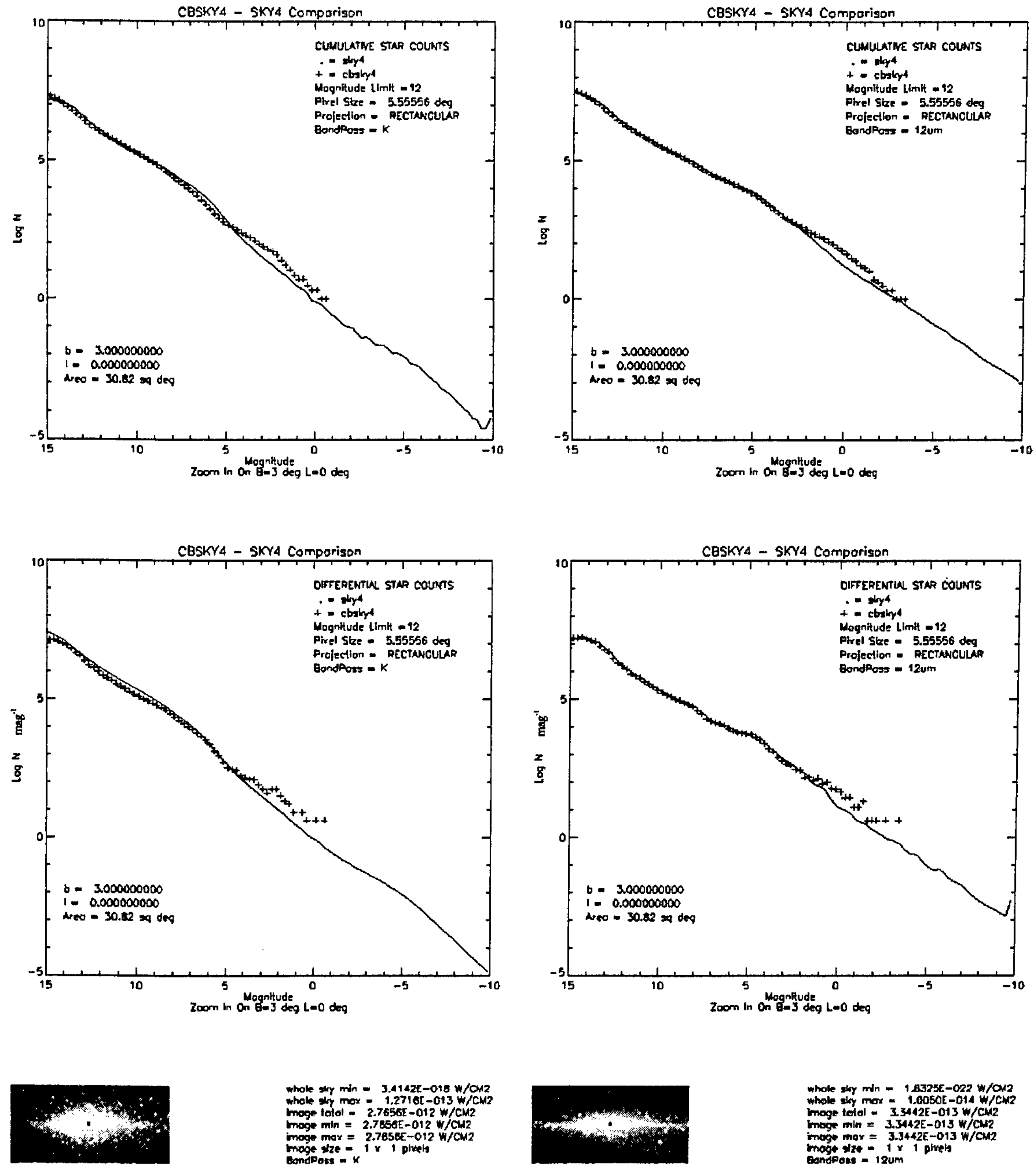


Figure C.22: SKY4 - CBSKY4 comparison for 5.56 deg around l = 3.0, b = 0.0.

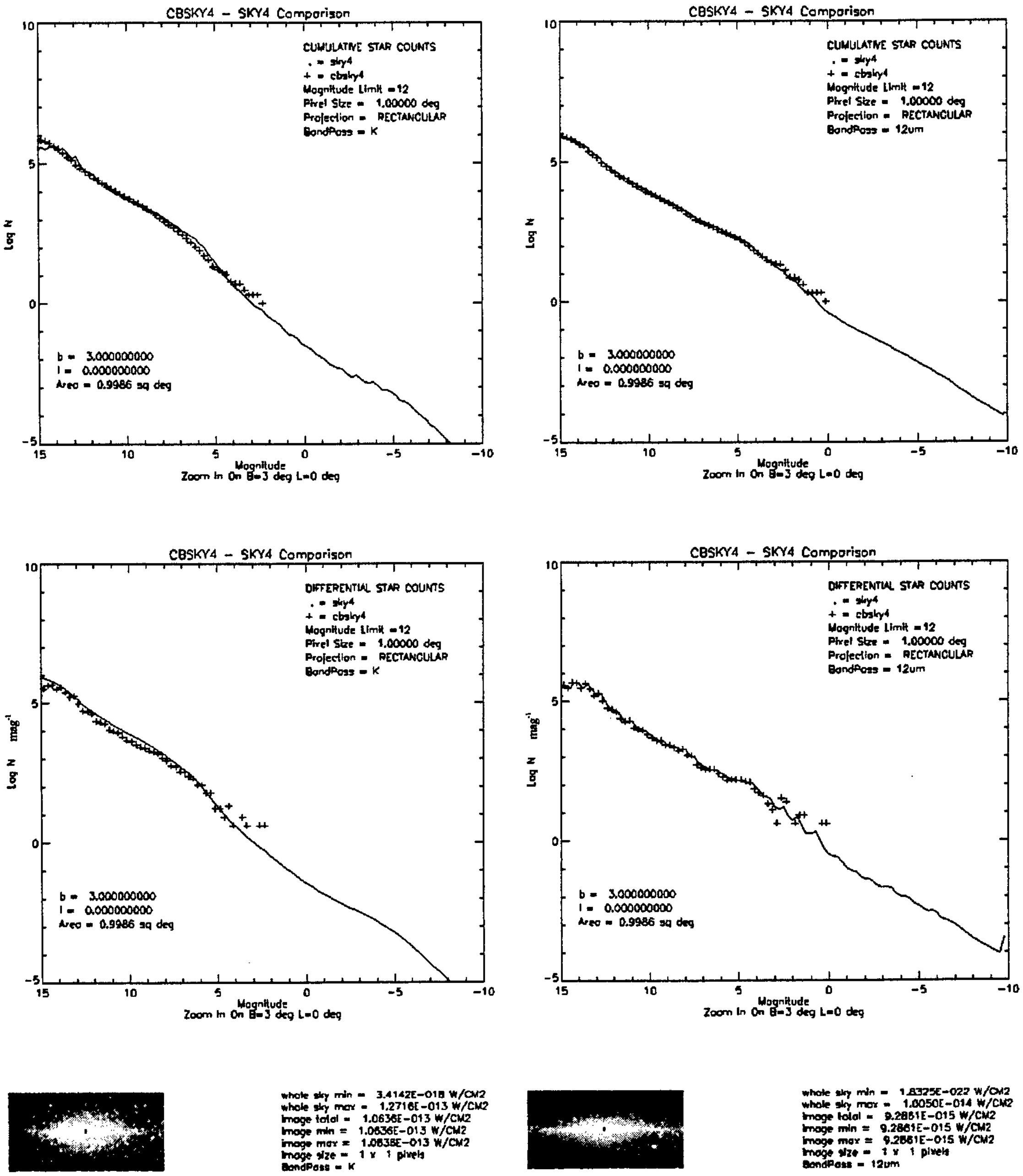


Figure C.23: SKY4 - CBSKY4 comparison for 1.0 deg around l = 3.0, b = 0.0.

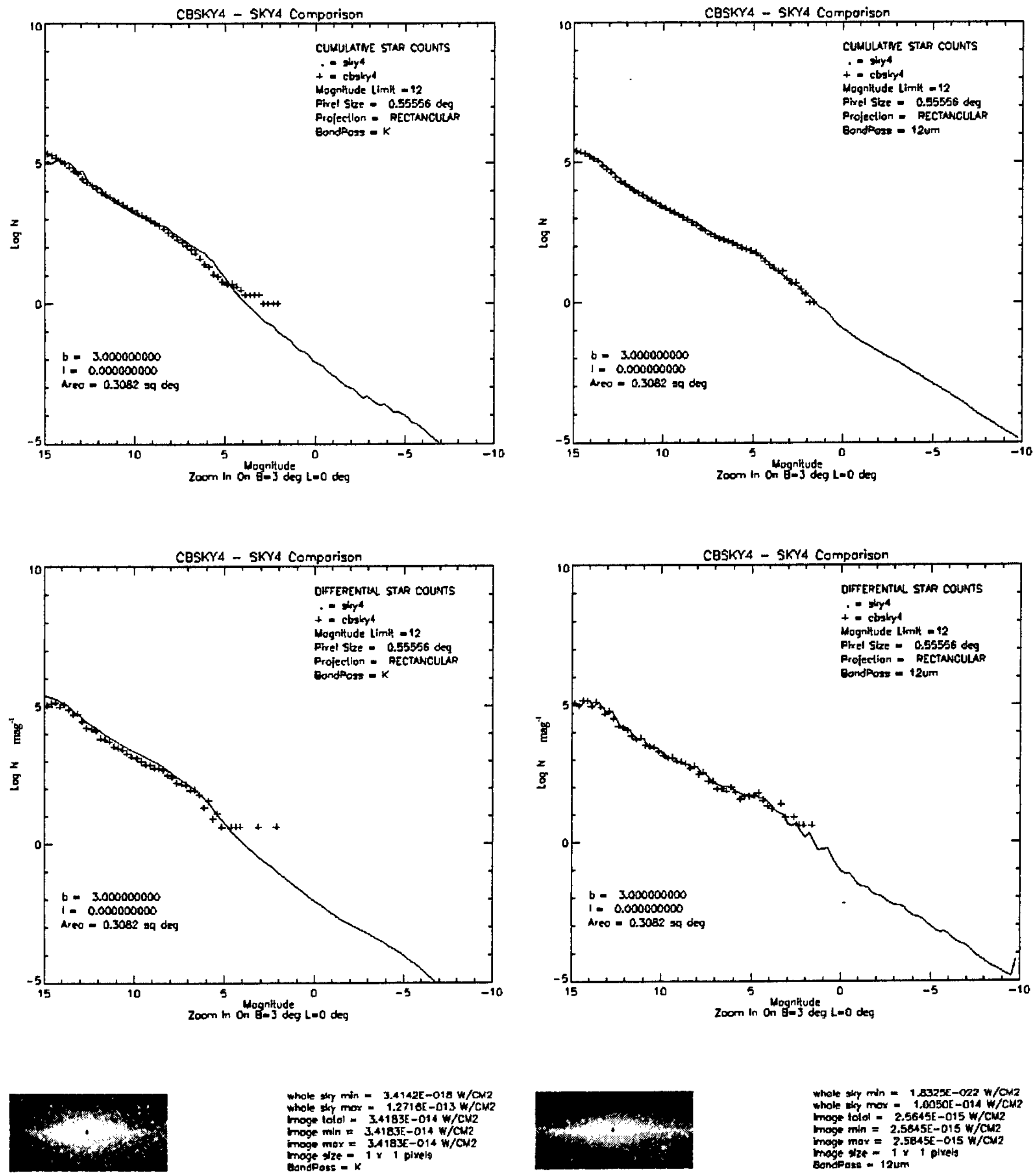


Figure C.24: SKY4 - CBSKY4 comparison for 0.556 deg around l = 3.0, b = 0.0.

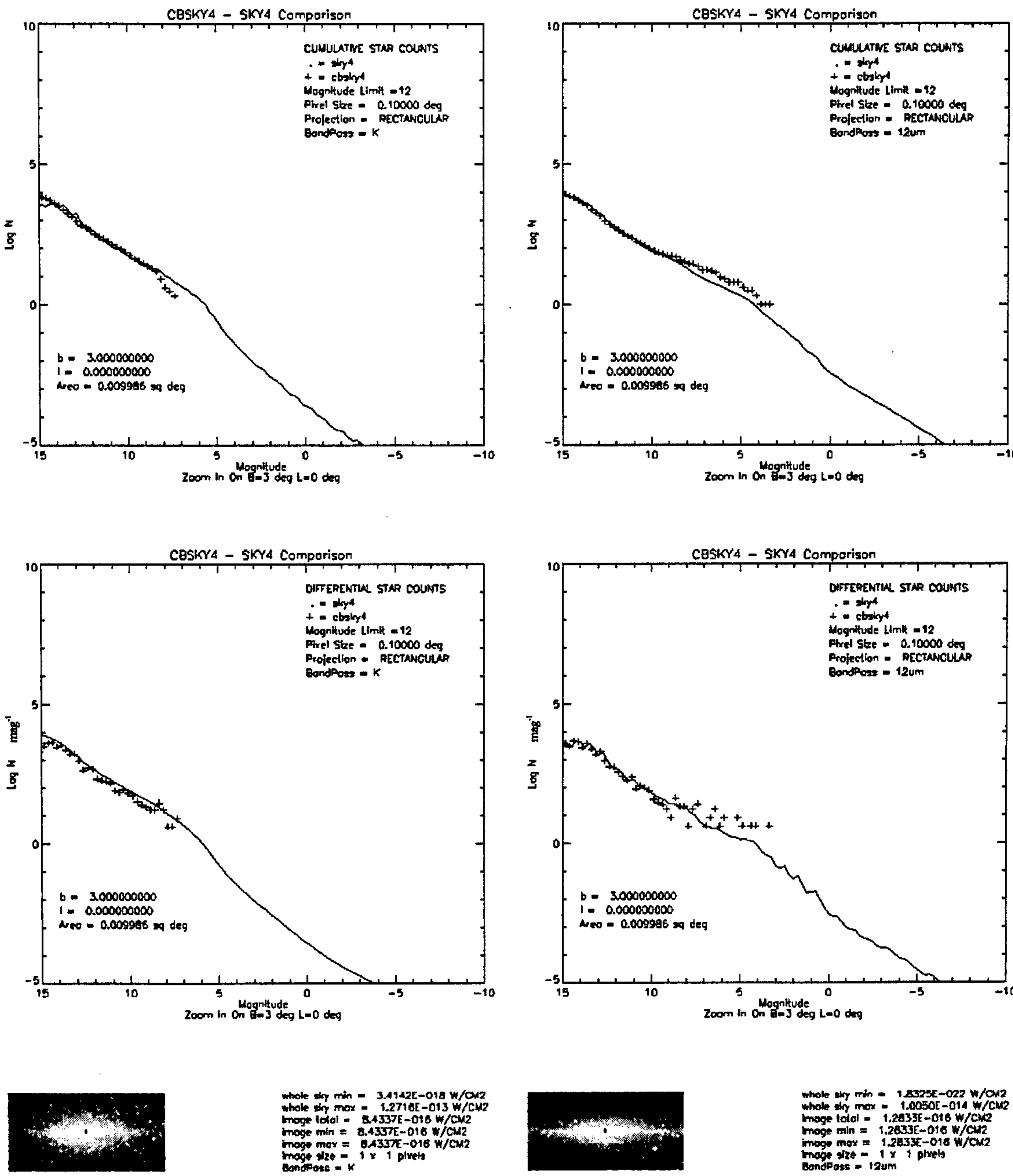


Figure C.25: SKY4 - CBSKY4 comparison for 0.1 deg around l = 3.0, b = 0.0.

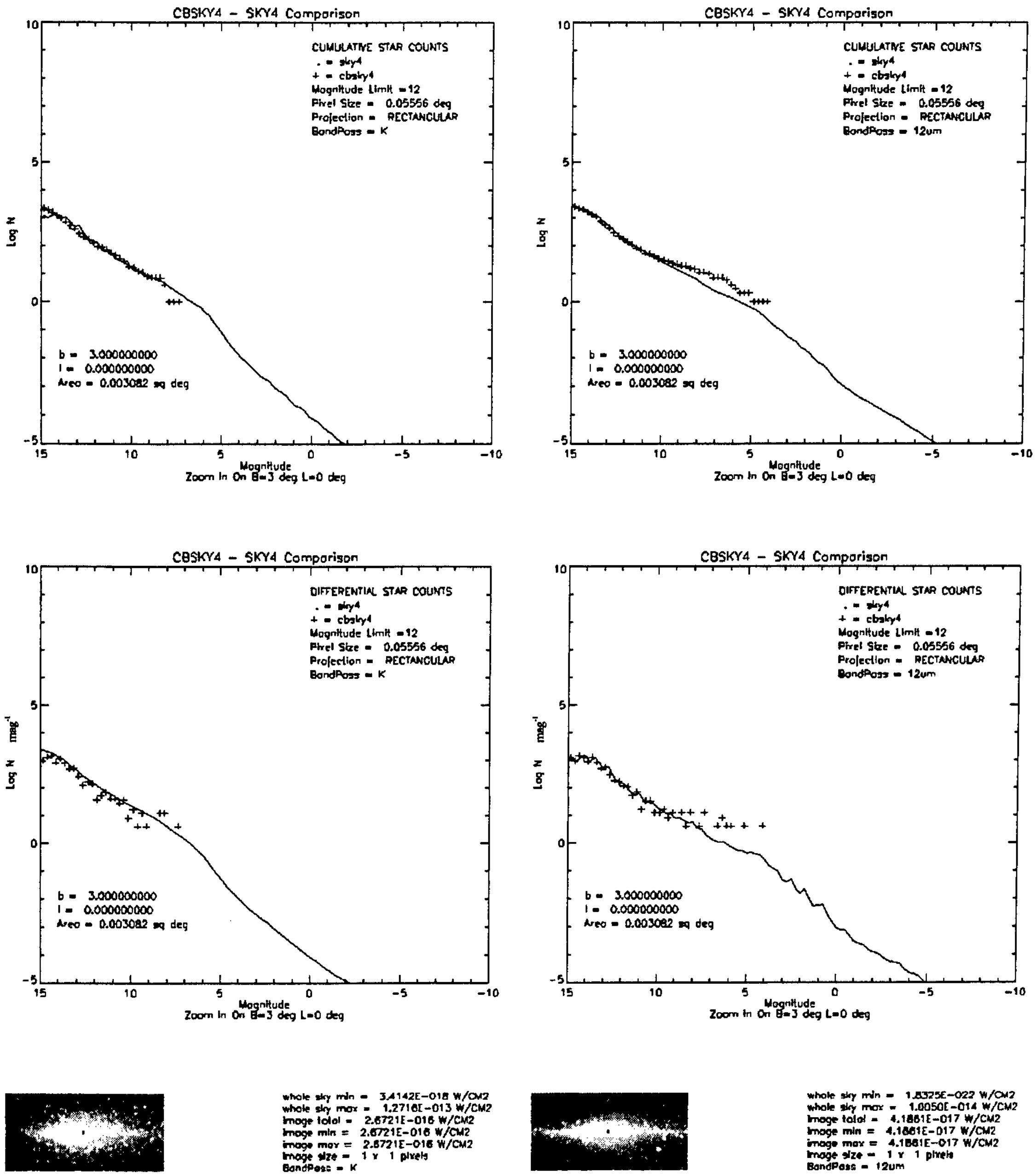


Figure C.26: SKY4 - CBSKY4 comparison for 0.0556 deg around l = 3.0, b = 0.0.

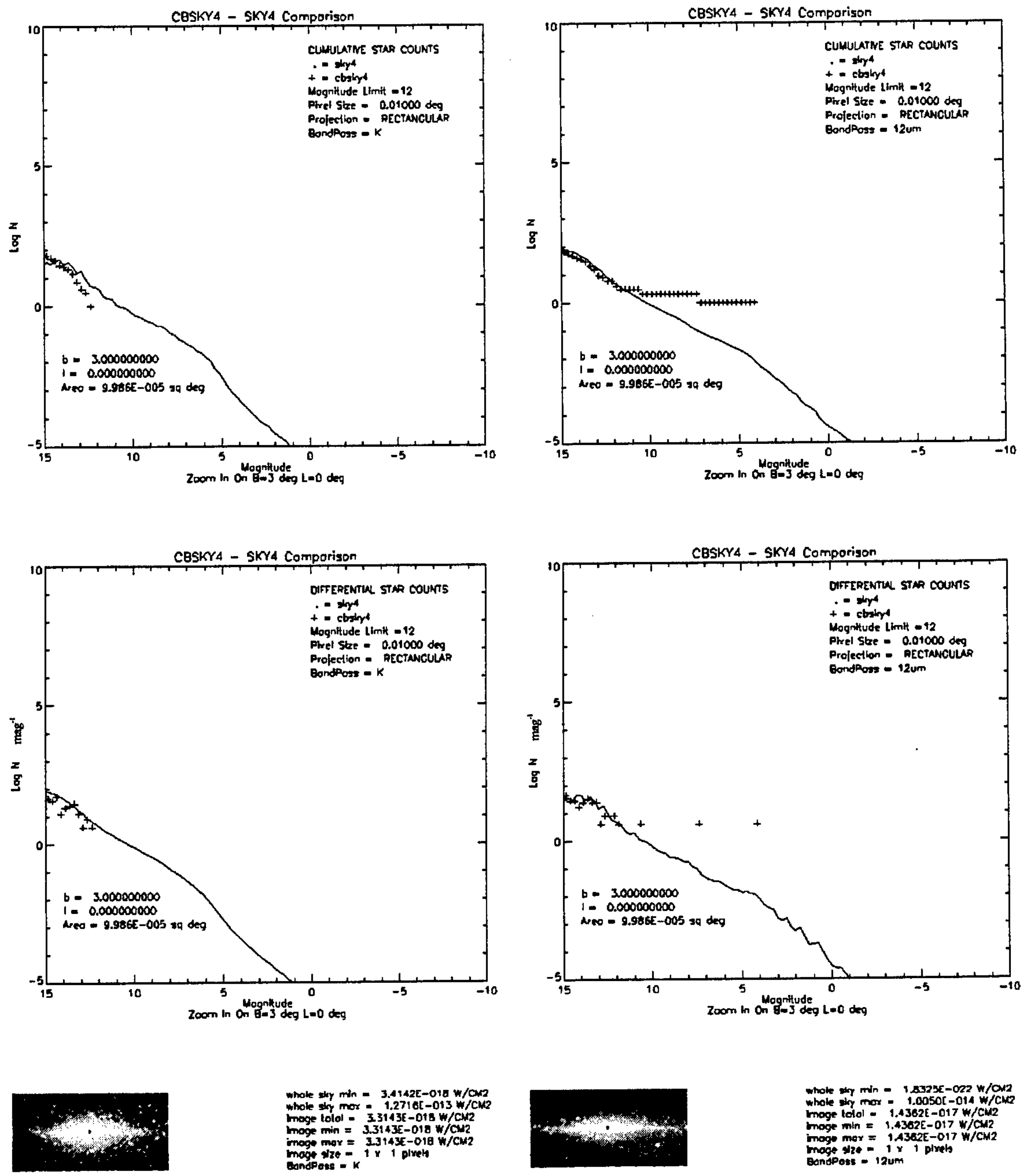


Figure C.27: SKY4 - CBSKY4 comparison for 0.01 deg around l = 3.0, b = 0.0.

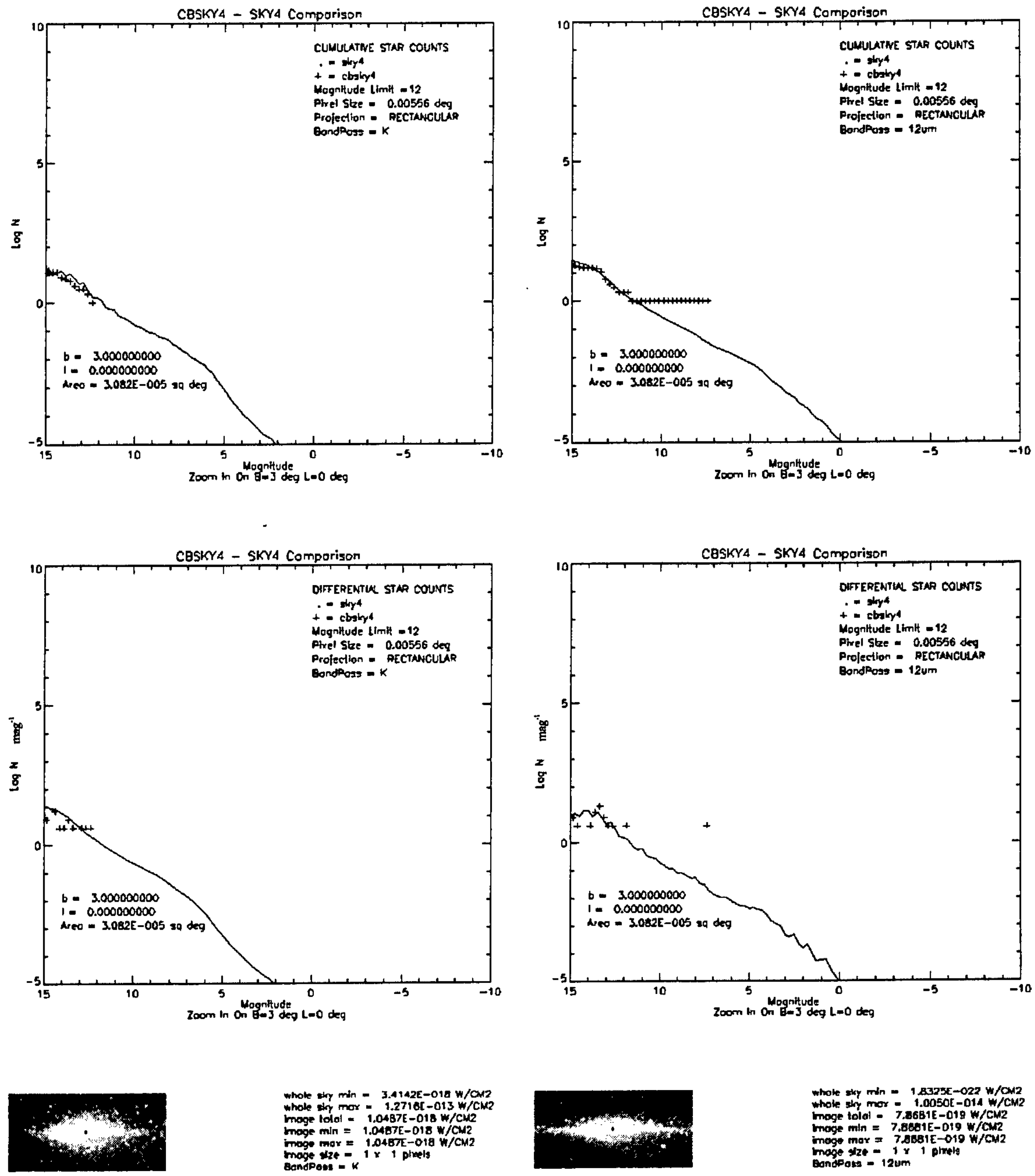


Figure C.28: SKY4 - CBSKY4 comparison for 0.00556 deg around l = 3.0, b = 0.0.

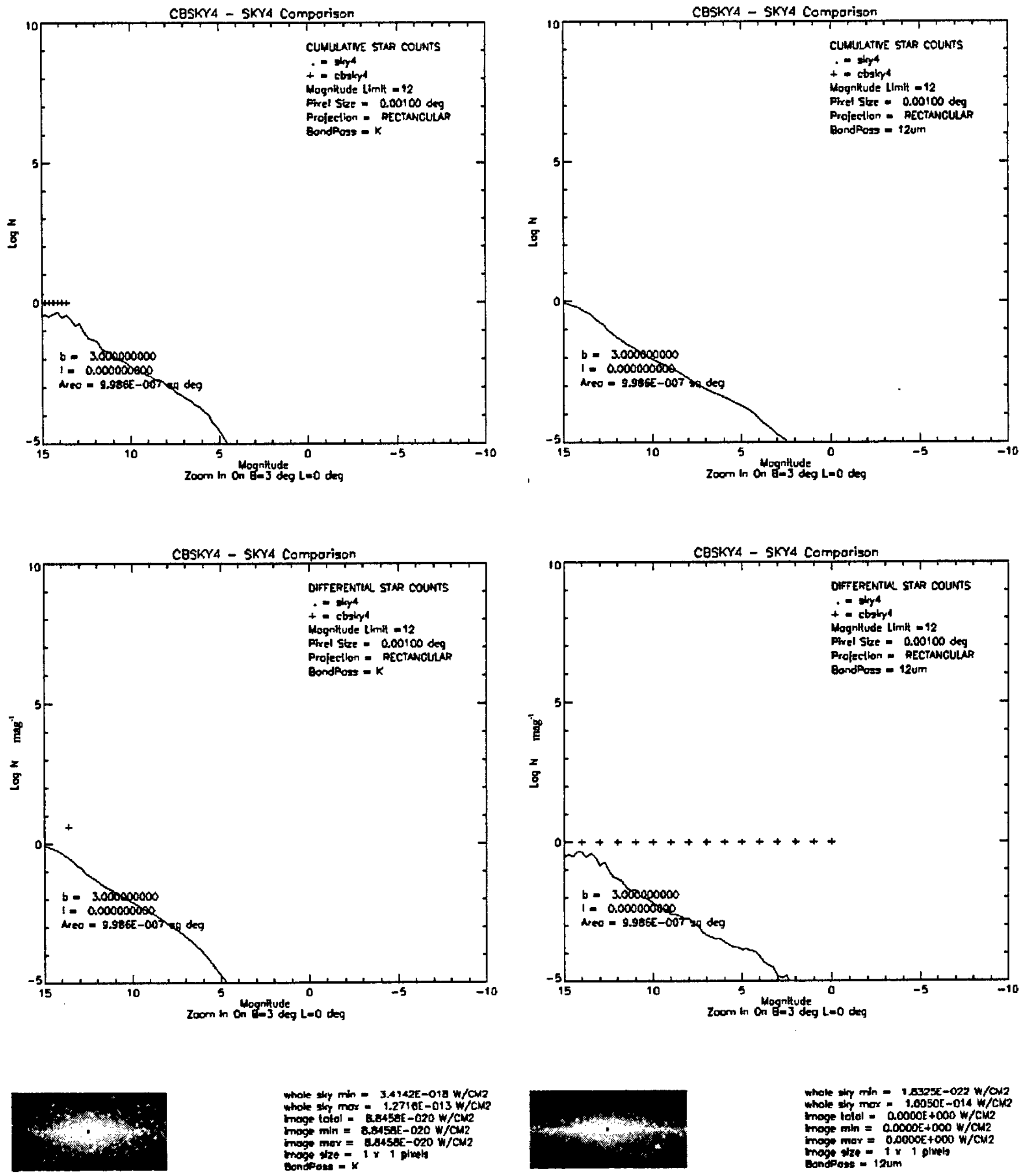


Figure C.29: SKY4 - CBSKY4 comparison for 0.001 deg around l = 3.0, b = 0.0.

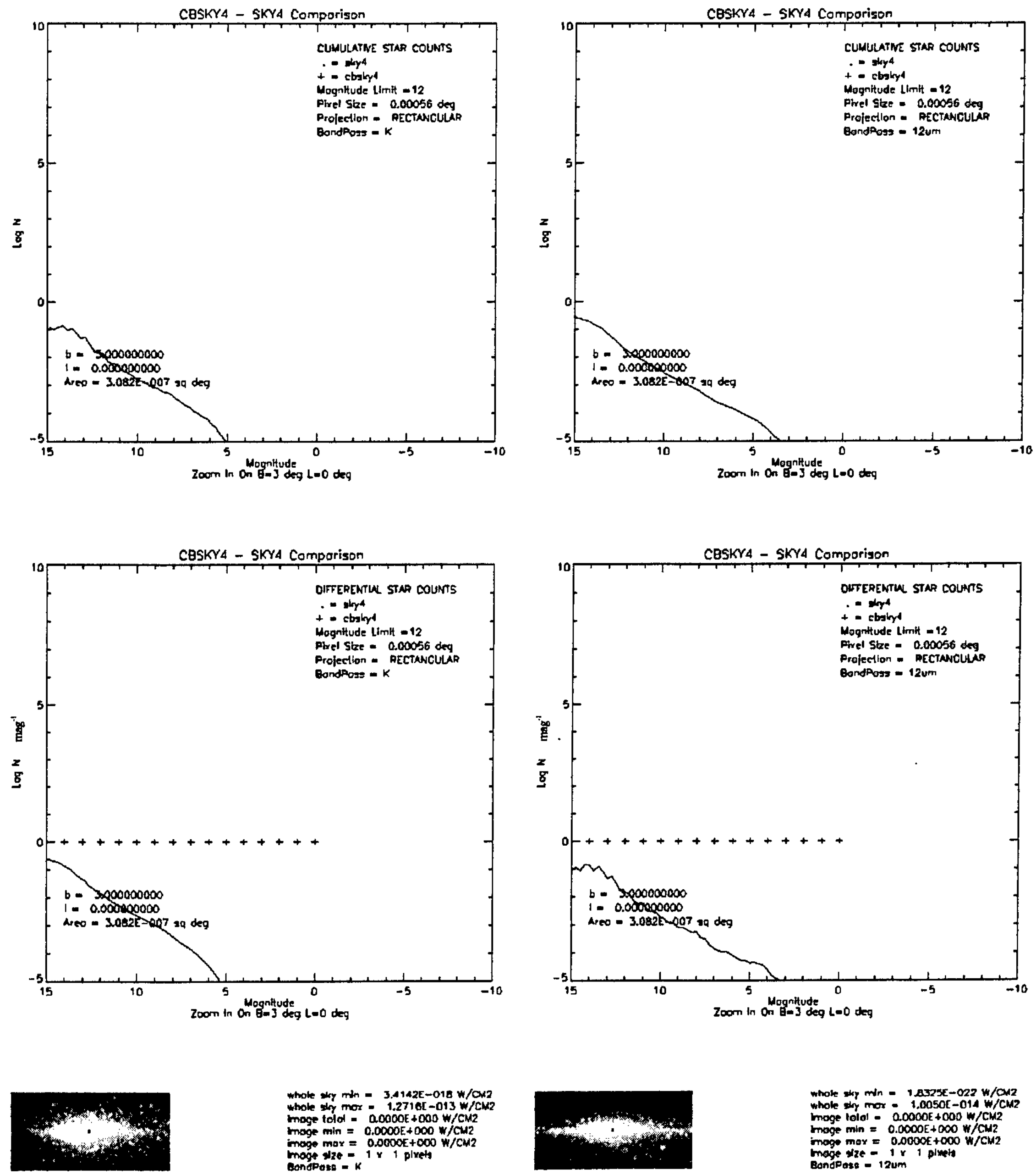


Figure C.30: SKY4 - CBSKY4 comparison for 0.000556 deg around l = 3.0, b = 0.0.

Appendix C.4

The region around l = -3 deg, b = 28 deg with the following pixel sizes (degrees) for Band K and 12μm:

10.0	5.56	1.0	0.556	0.10
0.0556	0.01	0.00556	0.001	0.000556

Table C.10: Interactive inputs used for the SKY4 runs around l =-3.0, b = 28.0.

Value Used	Description
y	Keep solar displacement of 15 pc N of plane.
y	Integrate over area.
see Table C.11	Limits of galactic latitude in degrees.
see Table C.11	Limits of galactic longitude in degrees.
see Table C.11	Incremental steps in latitude and longitude (in degrees).
n	No, don't print bright magnitudes-by-components information.
n	No, don't print surface brightness data.
n	No, don't bring back colors.
y	Yes, create LogN vs. LogS plots.
5 and 7	Use the pre-defined "12UM" bandpass (value = 7) and use the pre-defined "K" bandpass (value = 5) [This value is regressed upon, there are two separate SKY4 runs.]
y and n	Yes, plot the cumulative LogN on the y-axis, and no, plot the differential LogN on the y-axis. [This value is regressed upon, there are two separate SKY4 runs.]
y	Plot Magnitudes on x-axis.
n	No, don't plot observed points.

Table C.11: Region Definitions around l =-3.0, b = 28.0.

x_FOV (Deg)	Initial Latitude (Deg)	Final Latitude (Deg)	Initial Longitude (Deg)	Final Longitude (Deg)	Step Latitude (Deg)	Step Longitude (Deg)
1.00E+01	-8.00E+00	+2.00E+00	2.30E+01	3.30E+01	1.00E+00	1.00E+00
5.56E+00	-5.78E+00	-2.22E-01	2.52E+01	3.08E+01	5.56E-01	5.56E-01
1.00E+00	-3.50E+00	-2.50E+00	2.75E+01	2.85E+01	1.00E-01	1.00E-01
5.56E-01	-3.28E+00	-2.72E+00	2.77E+01	2.83E+01	5.56E-02	5.56E-02
1.00E-01	-3.05E+00	-2.95E+00	2.80E+01	2.81E+01	1.00E-02	1.00E-02
5.56E-02	-3.03E+00	-2.97E+00	2.80E+01	2.80E+01	5.56E-03	5.56E-03
1.00E-02	-3.01E+00	-3.00E+00	2.80E+01	2.80E+01	1.00E-03	1.00E-03
5.56E-03	-3.00E+00	-3.00E+00	2.80E+01	2.80E+01	5.56E-04	5.56E-04
1.00E-03	-3.00E+00	-3.00E+00	2.80E+01	2.80E+01	1.00E-04	1.00E-04
5.56E-04	-3.00E+00	-3.00E+00	2.80E+01	2.80E+01	5.56E-05	5.56E-05

Table C.12: CBSKY4 Inputs around l =-3.0, b = 28.0.

```
[Path]
architecture = DOS
path=\cbsd4\dataout\cbsky4\ZoomIn_B
-3_L28_12um\
code_path=\cbsd4\cbsd\cbsky4
data_path=\cbsd4\cbsd\sky4data
verbose = YES

[cbsky4]
log_output = ZoomIn_P1.log
map = NO
real_stars = NO
statistical_stars = YES
clouds = YES
magnitude_limit = 15
seed = 346
method = CENTER
catalog = NO
catalog_limit = 10
nodesfile = NODE_IAH.DAT
elementsfile = ELEM_IAH.DAT
extinction = YES
count_statistics = YES
x-axis = MAGNITUDES
y-axis = Differential
errmap = NO
extmap = NO
spectral_type = 0

[convolution]
convolution = NO
point_spread_function = gaussian
psf_half_width = 1.01
```

```
[Image]
Image = YES
output_format = FITS
image_type=4-BYTE REAL
image_projection = RECTANGULAR
x_column_pixels = 1
y_row_pixels = 1
pixel_size = 10.0000000000000
image_center_longitude_degrees =
28.000000000
image_center_latitude = -
3.000000000
units = W/CM2

[Positional]
observer_altitude = 0.0
observer_geographic_latitude = 0.0
observer_geographic_longitude = 0.0
Reference_Frame = B1950
coordinate_system = galactic
positions = apparent
Reference_system = geocentric

[spectral]
start_wavelength =12um
end_wavelength=12um

[Time]
observation_date=2 2 2000
observation_time=0 0 0.0
```

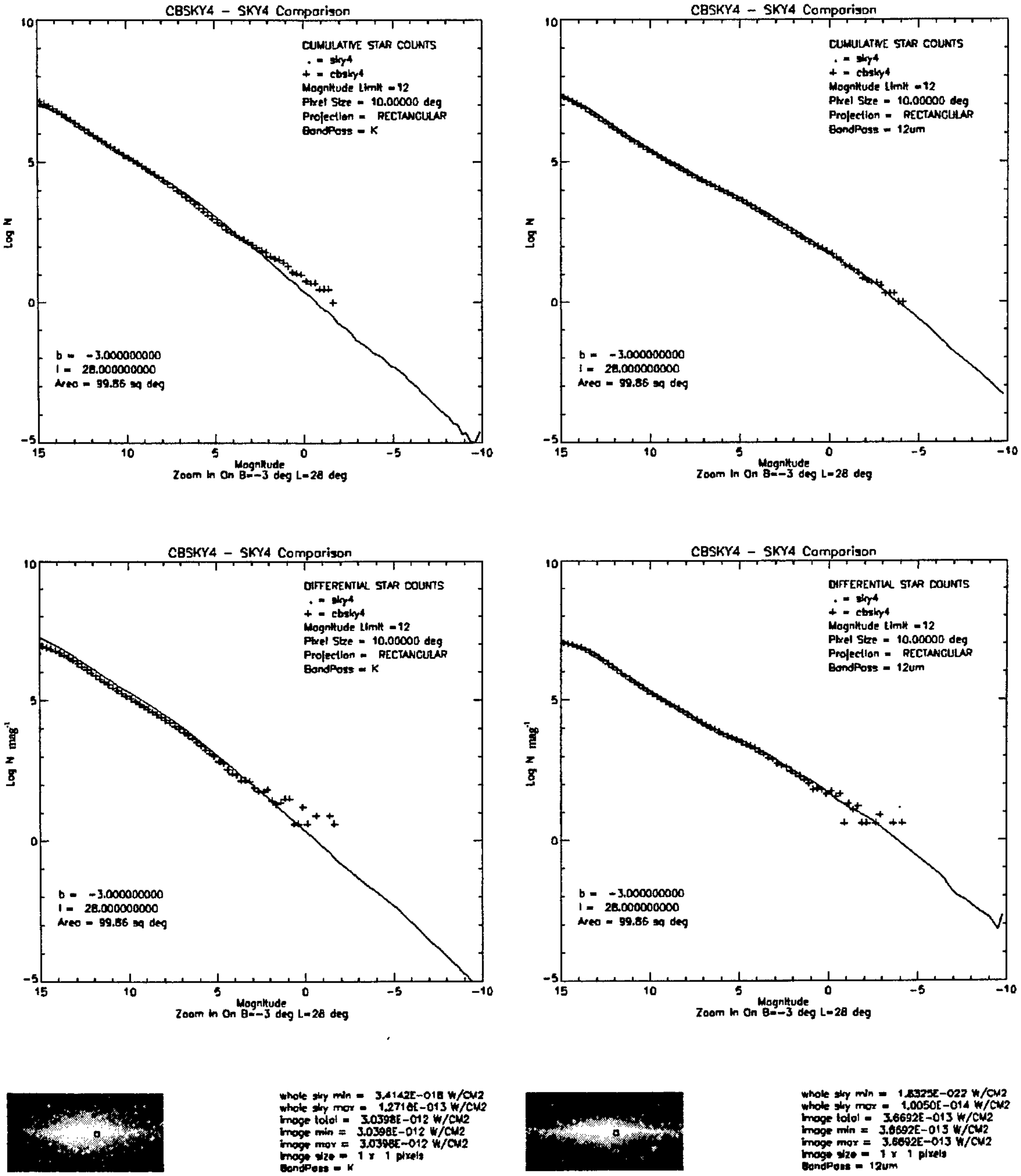


Figure C.31: SKY4 - CBSKY4 comparison for 10.0 deg around l = -3.0, b = 28.0.

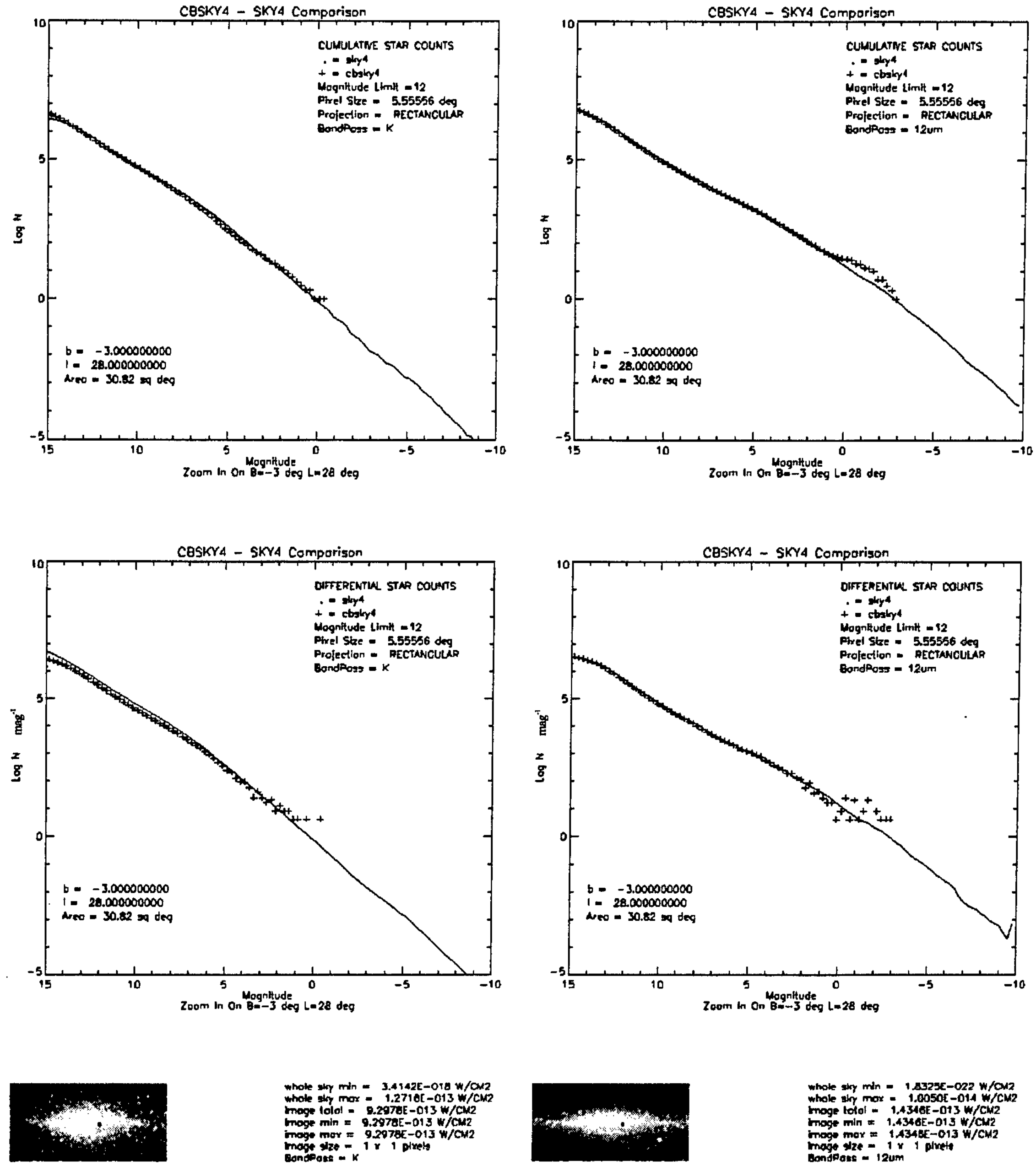


Figure C.32: SKY4 - CBSKY4 comparison for 5.56 deg around l = -3.0, b = 28.0.

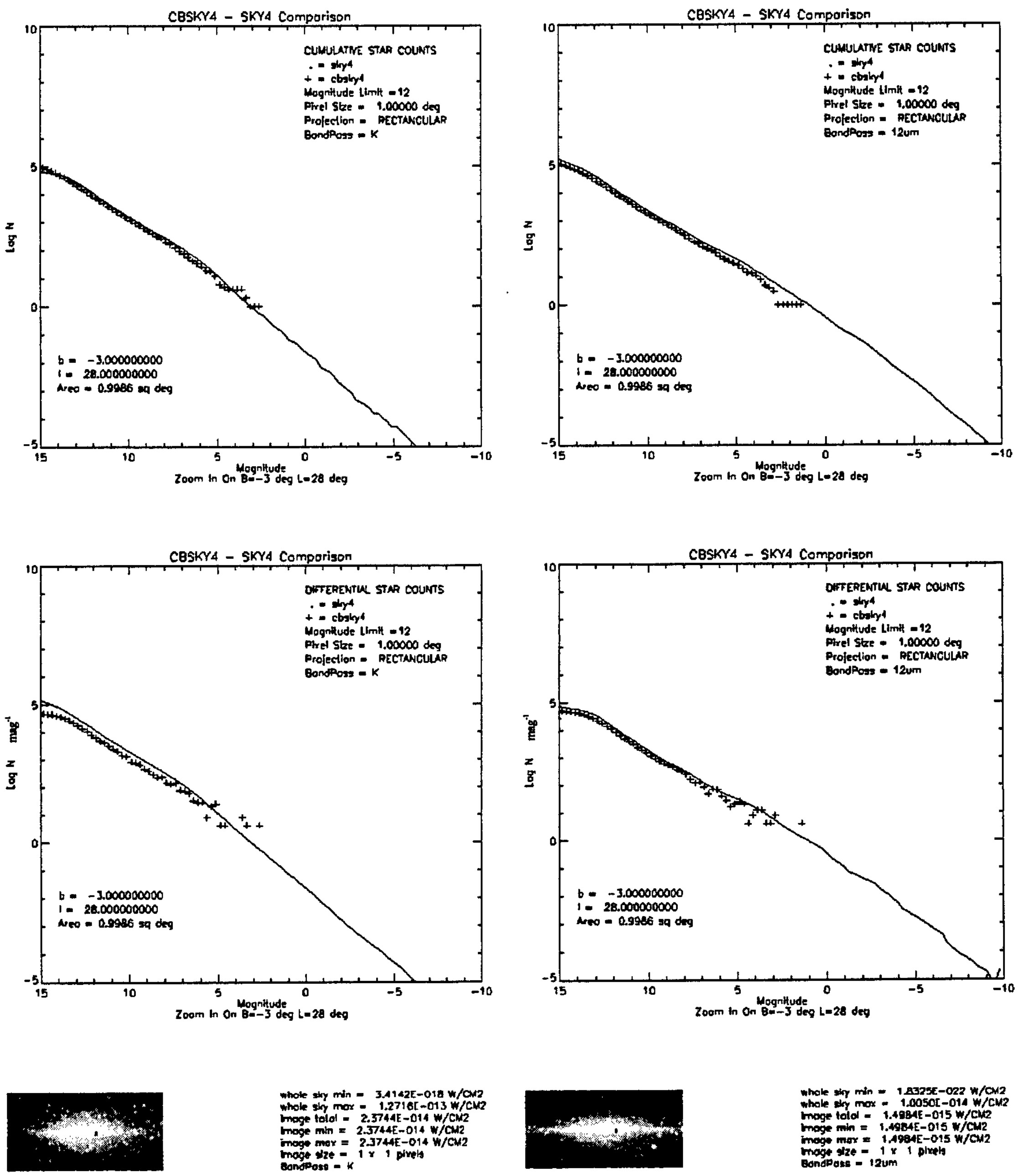


Figure C.33: SKY4 - CBSKY4 comparison for 1.0 deg around l = -3.0, b = 28.0.

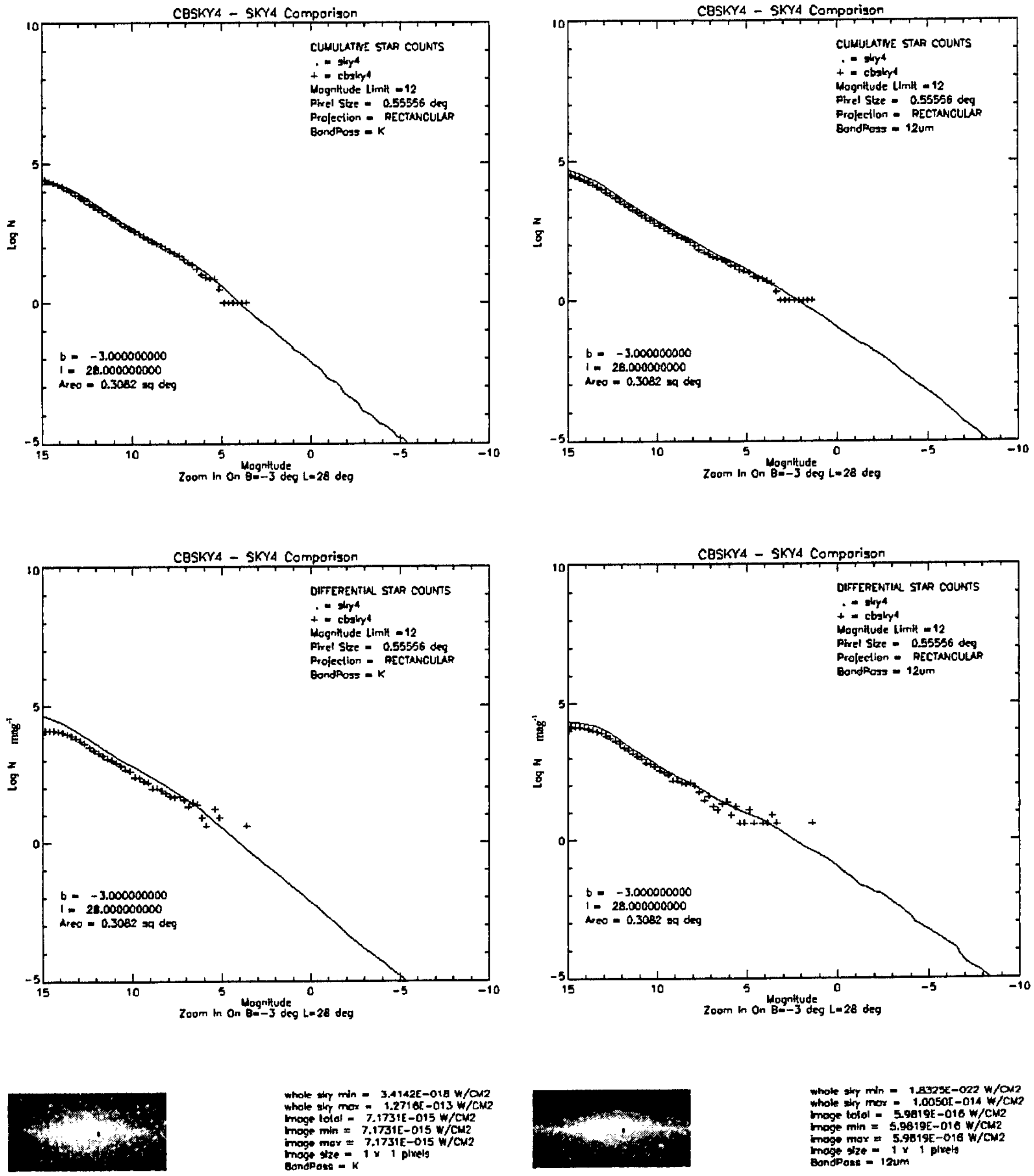


Figure C.34: SKY4 - CBSKY4 comparison for 0.556 deg around l = -3.0, b = 28.0.

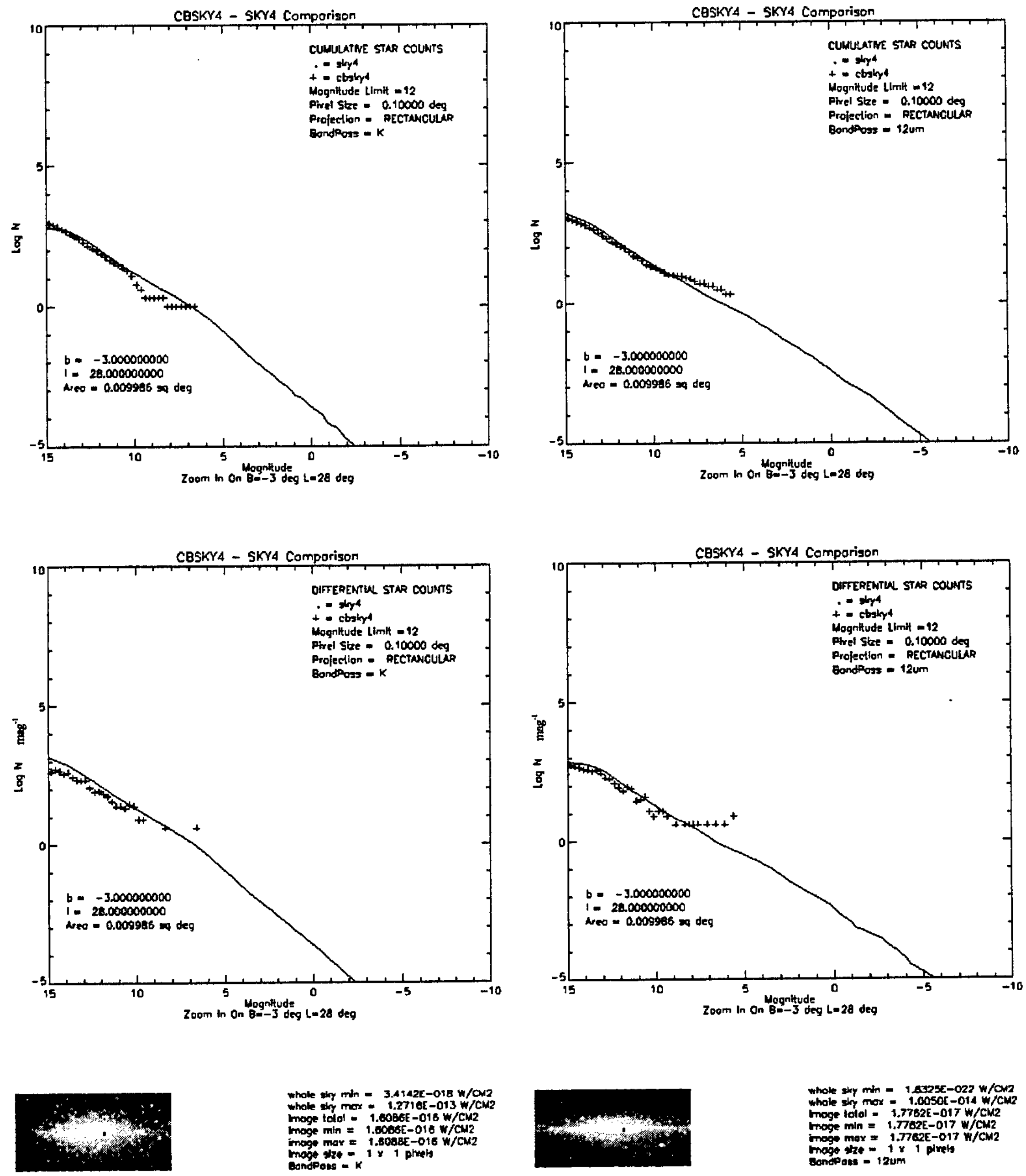


Figure C.35: SKY4 - CBSKY4 comparison for 0.1 deg around l = -3.0, b = 28.0.

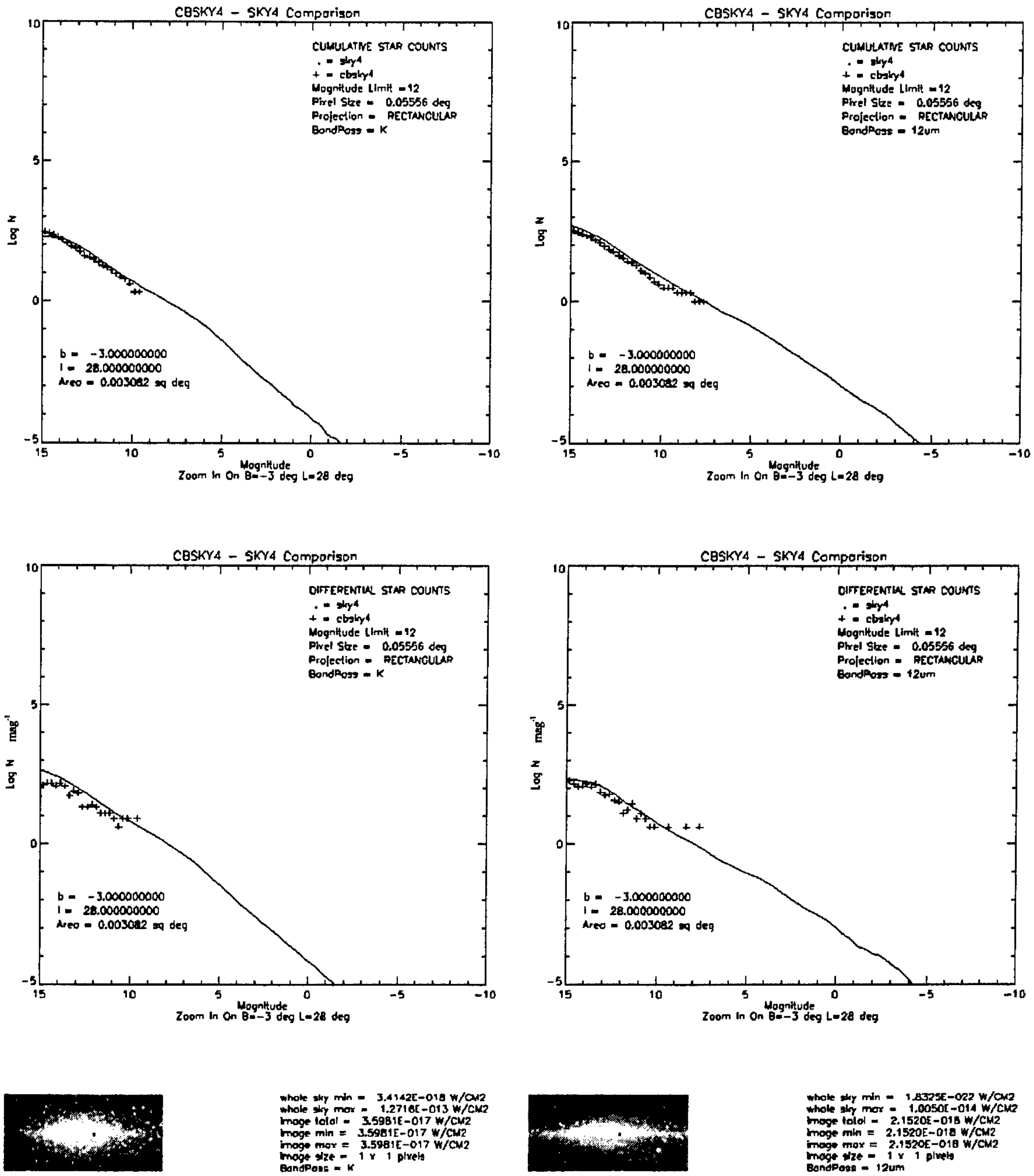


Figure C.36: SKY4 - CBSKY4 comparison for 0.0556 deg around l = -3.0, b = 28.0.

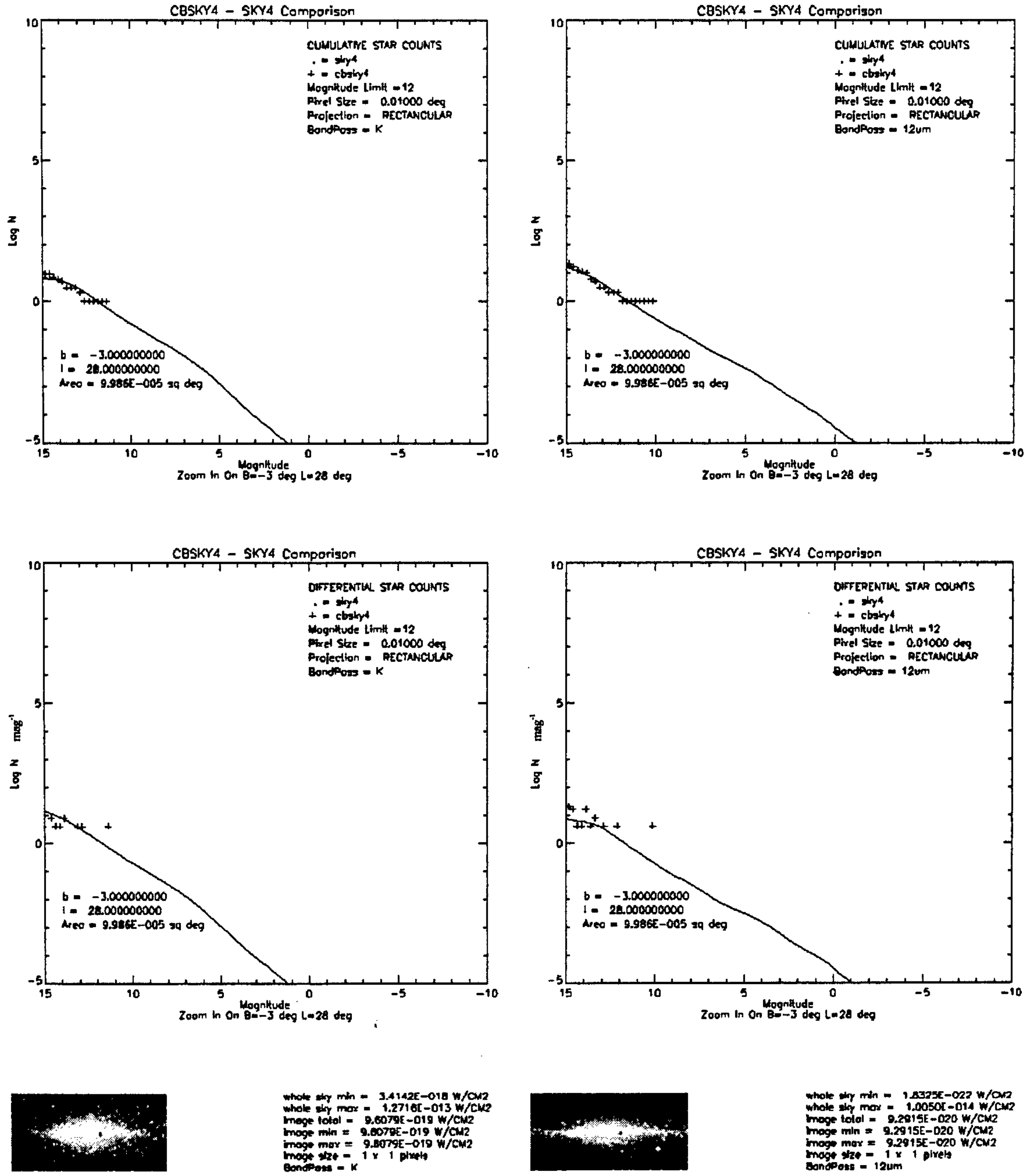


Figure C.37: SKY4 - CBSKY4 comparison for 0.01 deg around l = -3.0, b = 28.0.

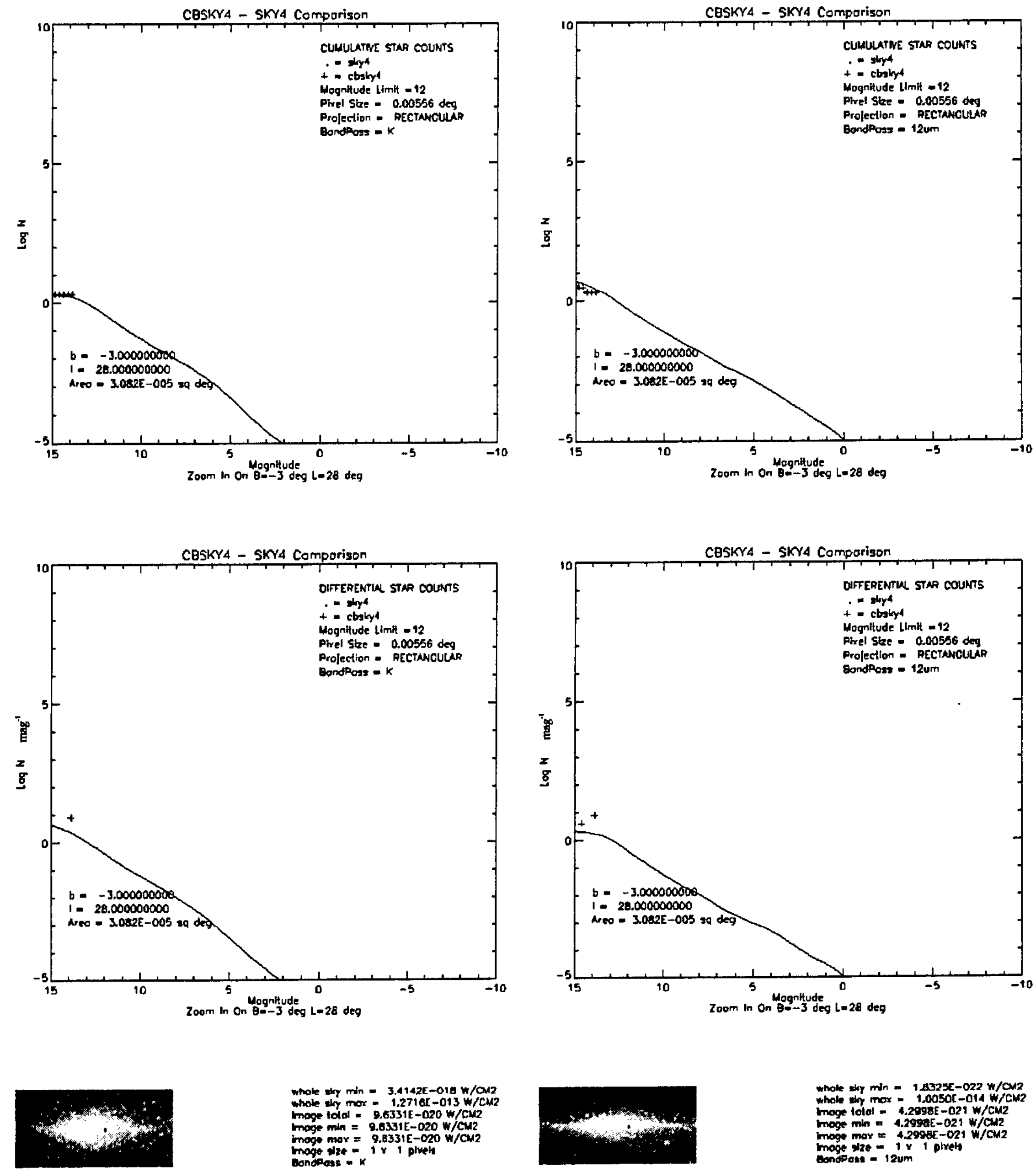


Figure C.38: SKY4 - CBSKY4 comparison for 0.00556 deg around l = -3.0, b = 28.0.

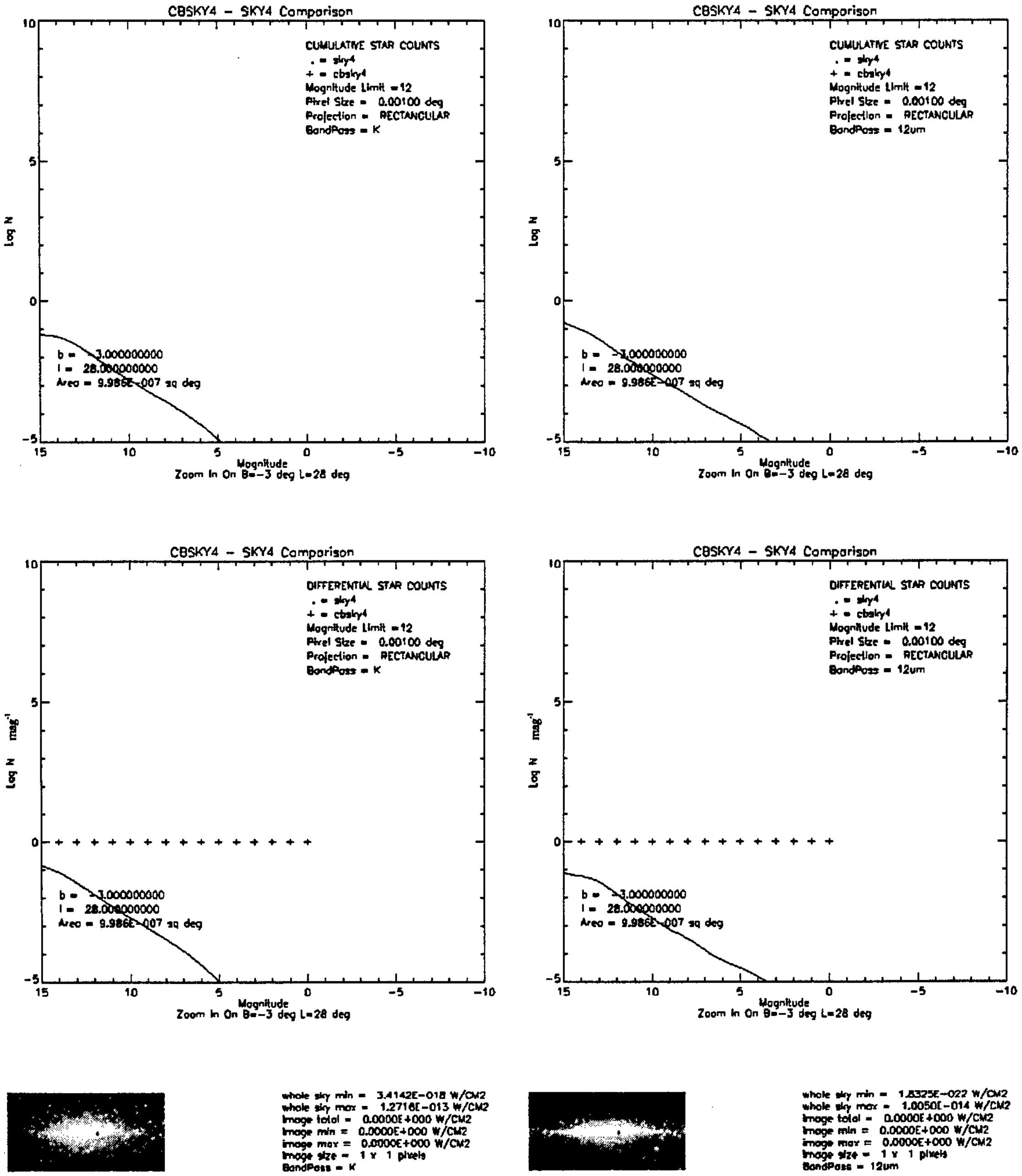


Figure C.39: SKY4 - CBSKY4 comparison for 0.001 deg around l = -3.0, b = 28.0.

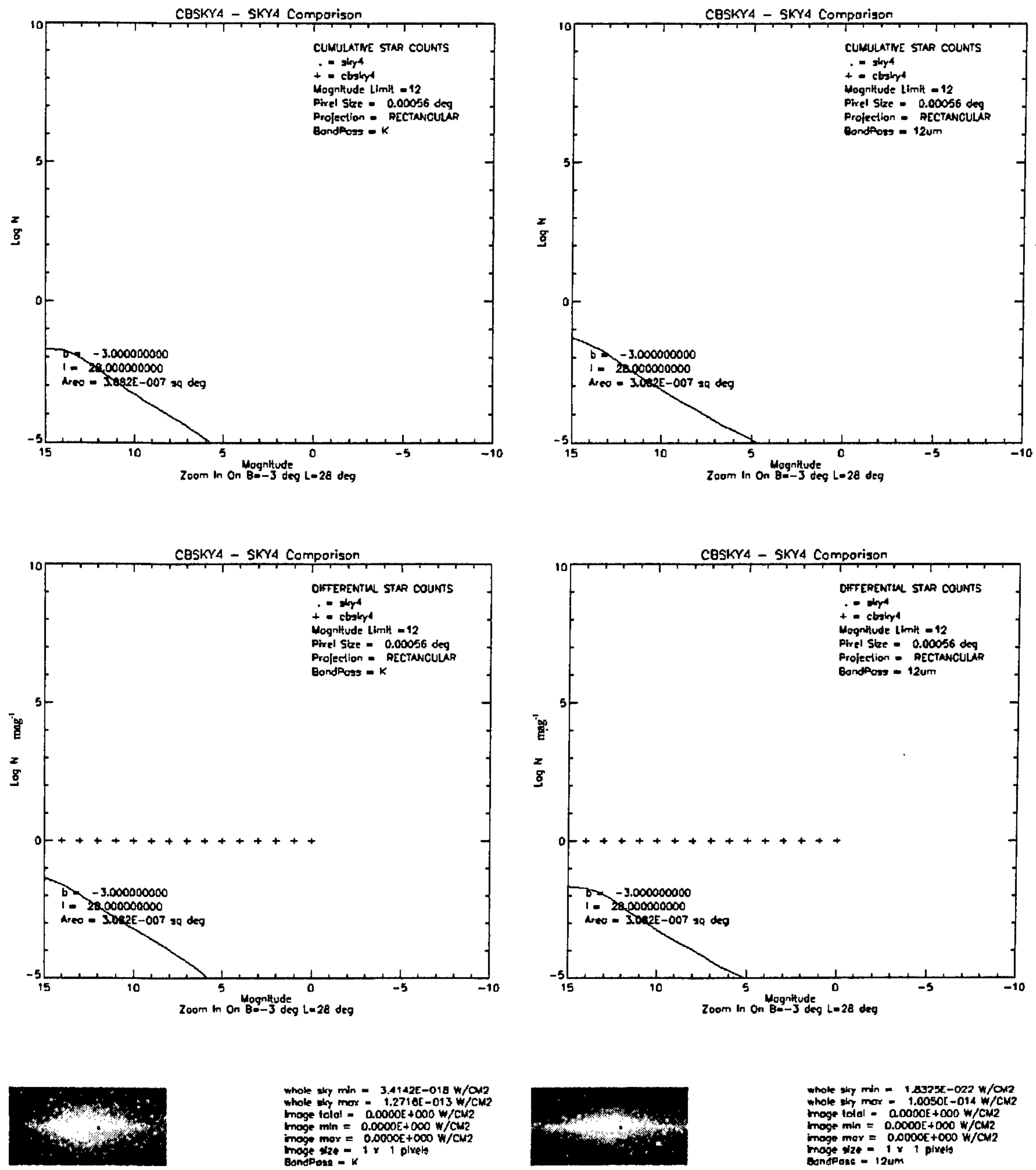


Figure C.40: SKY4 - CBSKY4 comparison for 0.000556 deg around l = -3.0, b = 28.0.

Appendix C.5

The region around l = 0 deg, b = 28 deg with the following pixel sizes (degrees) for Band K and 12μm:

10.0	5.56	1.0	0.556	0.10
0.0556	0.01	0.00556	0.001	0.000556

Table C.13: Interactive inputs used for the SKY4 runs around l =0.0, b = 28.0.

Value Used	**Description**
y	Keep solar displacement of 15 pc N of plane.
y	Integrate over area.
see Table C.14	Limits of galactic latitude in degrees.
see Table C.14	Limits of galactic longitude in degrees.
see Table C.14	Incremental steps in latitude and longitude (in degrees).
n	No, don't print bright magnitudes-by-components information.
n	No, don't print surface brightness data.
n	No, don't bring back colors.
y	Yes, create LogN vs. LogS plots.
5 and 7	Use the pre-defined "12UM" bandpass (value = 7) and use the pre-defined "K" bandpass (value = 5) [This value is regressed upon, there are two separate SKY4 runs.]
y and n	Yes, plot the cumulative LogN on the y-axis, and no, plot the differential LogN on the y-axis. [This value is regressed upon, there are two separate SKY4 runs.]
y	Plot Magnitudes on x-axis.
n	No, don't plot observed points.

Table C.14: Region Definitions around l =0.0, b = 28.0.

x_FOV (Deg)	Initial Latitude (Deg)	Final Latitude (Deg)	Initial Longitude (Deg)	Final Longitude (Deg)	Step Latitude (Deg)	Step Longitude (Deg)
1.00E+01	-5.00E+00	5.00E+00	2.30E+01	3.30E+01	1.00E+00	1.00E+00
5.56E+00	-2.78E+00	2.78E+00	2.52E+01	3.08E+01	5.56E-01	5.56E-01
1.00E+00	-5.00E-01	5.00E-01	2.75E+01	2.85E+01	1.00E-01	1.00E-01
5.56E-01	-2.78E-01	2.78E-01	2.77E+01	2.83E+01	5.56E-02	5.56E-02
1.00E-01	-5.00E-02	5.00E-02	2.80E+01	2.81E+01	1.00E-02	1.00E-02
5.56E-02	-2.78E-02	2.78E-02	2.80E+01	2.80E+01	5.56E-03	5.56E-03
1.00E-02	-5.00E-03	5.00E-03	2.80E+01	2.80E+01	1.00E-03	1.00E-03
5.56E-03	-2.78E-03	2.78E-03	2.80E+01	2.80E+01	5.56E-04	5.56E-04
1.00E-03	-5.00E-04	5.00E-04	2.80E+01	2.80E+01	1.00E-04	1.00E-04
5.56E-04	-2.78E-04	2.78E-04	2.80E+01	2.80E+01	5.56E-05	5.56E-05

Table C.15: CBSKY4 Inputs around l =0.0, b = 28.0.

```
[Path]
architecture = DOS
path=\cbsd4\dataout\cbsky4\ZoomIn_B
0_L28_12um\
code_path=\cbsd4\cbsd\cbsky4
data_path=\cbsd4\cbsd\sky4data
verbose = YES

[cbsky4]
log_output = ZoomIn_P1.log
map = NO
real_stars = NO
statistical_stars = YES
clouds = YES
magnitude_limit = 15
seed = 346
method = CENTER
catalog = NO
catalog_limit = 10
nodesfile = NODE_IAH.DAT
elementsfile = ELEM_IAH.DAT
extinction = YES
count_statistics = YES
x-axis = MAGNITUDES
y-axis = Differential
errmap = NO
extmap = NO
spectral_type = 0

[convolution]
convolution = NO
point_spread_function = gaussian
psf_half_width = 1.01
```

```
[Image]
Image = YES
output_format = FITS
image_type=4-BYTE REAL
image_projection = RECTANGULAR
x_column_pixels = 1
y_row_pixels = 1
pixel_size = 10.0000000000000
image_center_longitude_degrees =
28.000000000
image_center_latitude = 0.000000000
units = W/CM2

[Positional]
observer_altitude = 0.0
observer_geographic_latitude = 0.0
observer_geographic_longitude = 0.0
Reference_Frame = B1950
coordinate_system = galactic
positions = apparent
Reference_system = geocentric

[spectral]
start_wavelength =12um
end_wavelength=12um

[Time]
observation_date=2 2 2000
observation_time=0 0 0.0
```

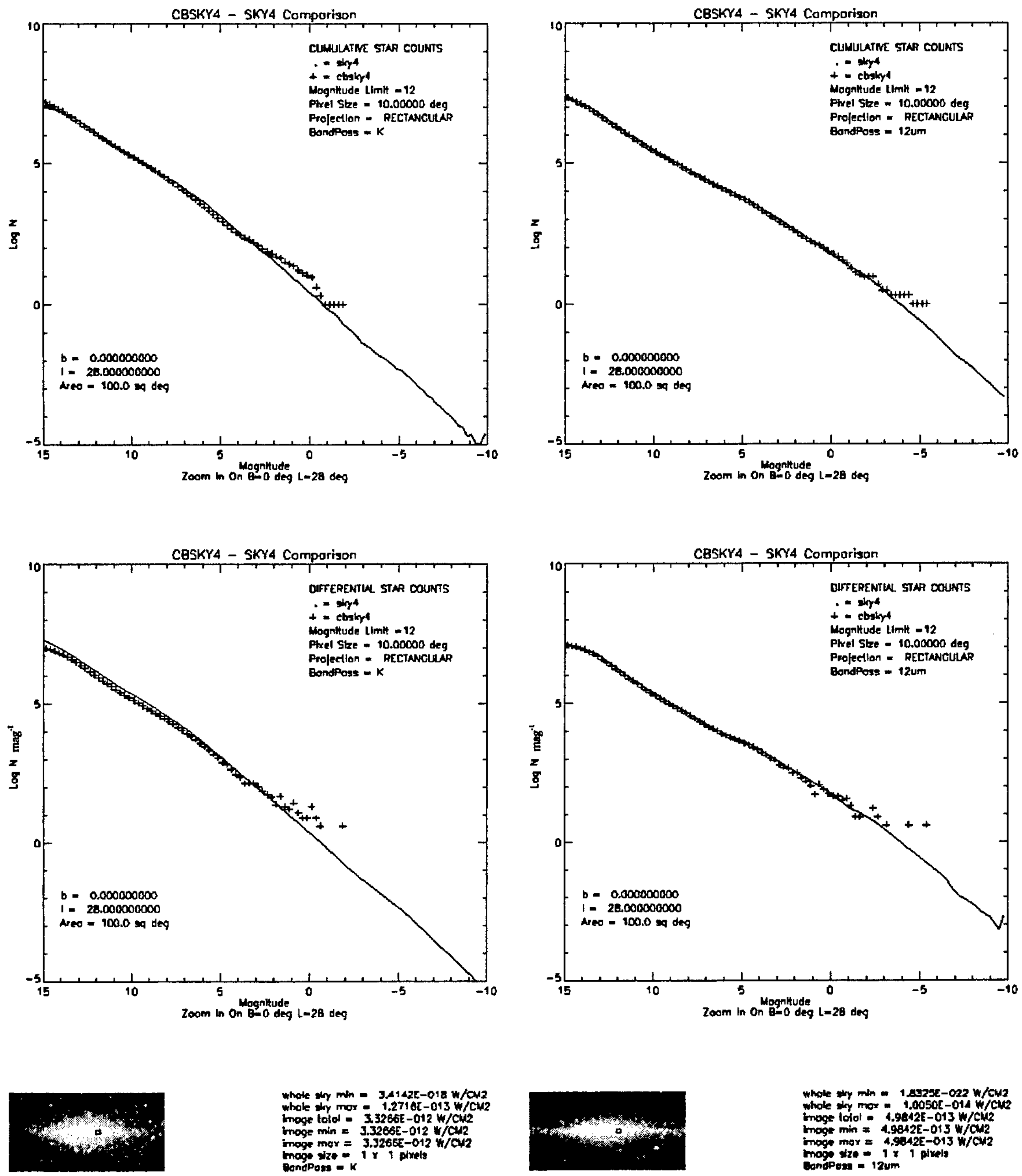


Figure C.41: SKY4 - CBSKY4 comparison for 10.0 deg around l = 0.0, b = 28.0.

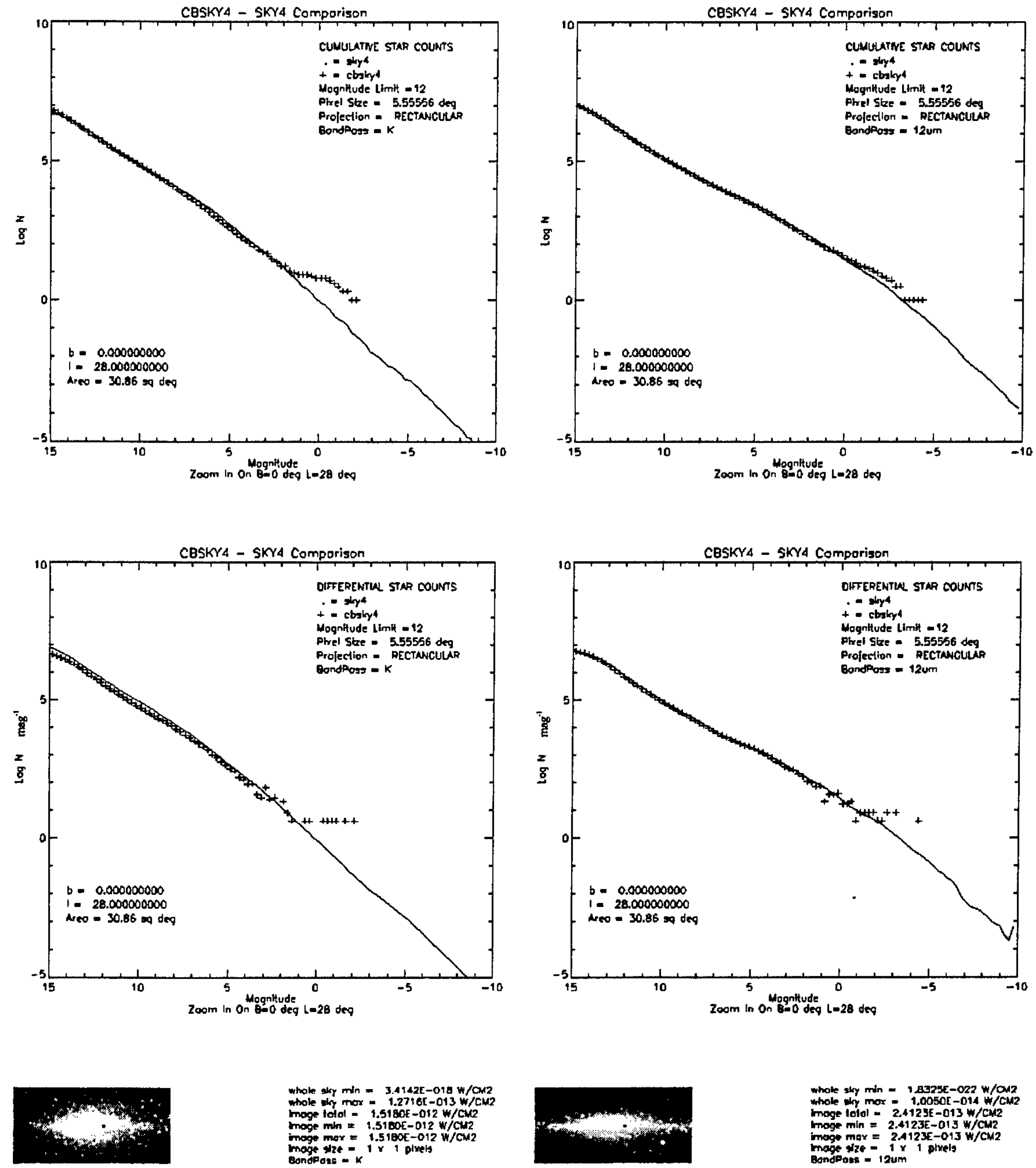


Figure C.42: SKY4 - CBSKY4 comparison for 5.56 deg around l = 0.0, b = 28.0.

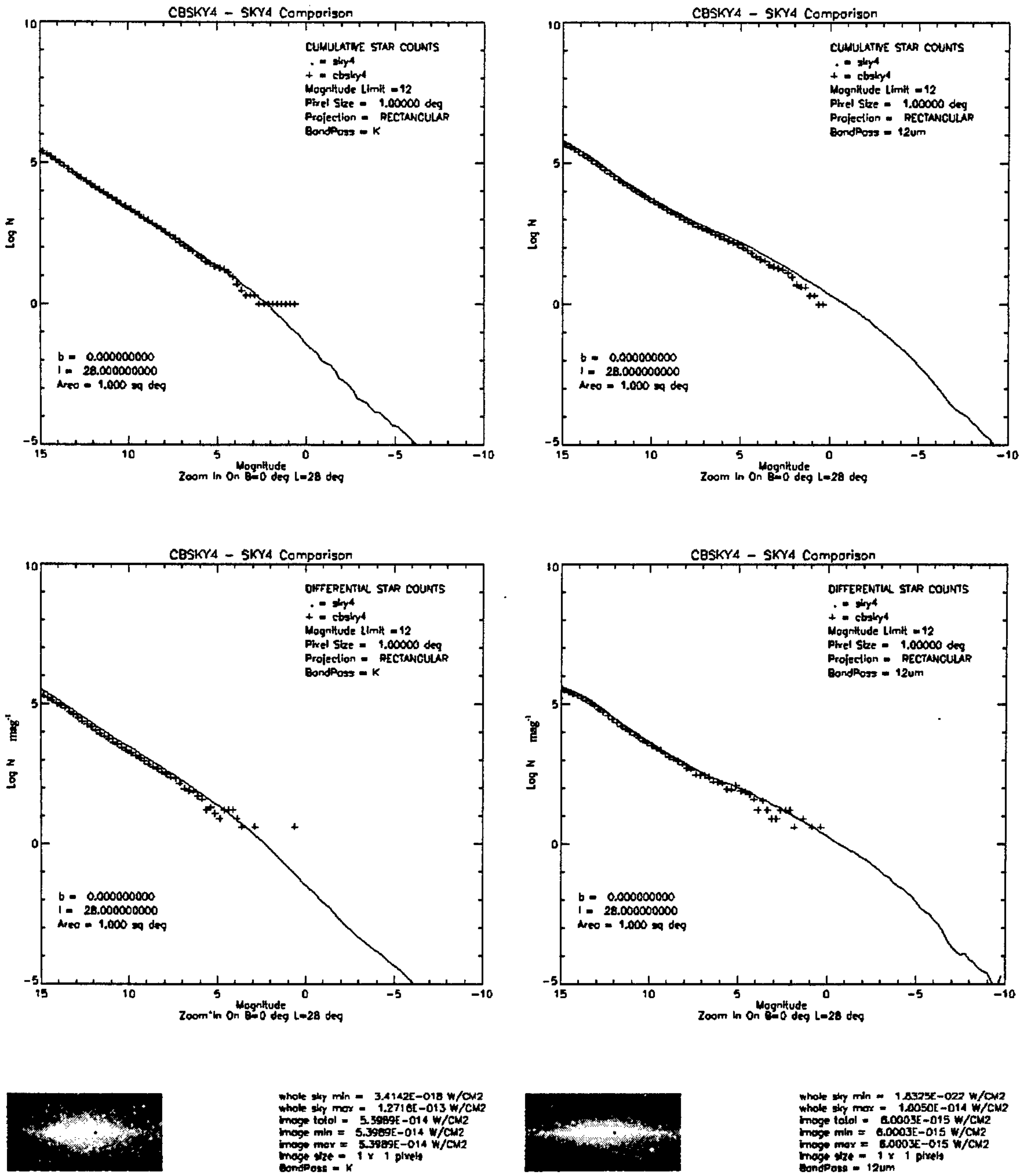


Figure C.43: SKY4 - CBSKY4 comparison for 1.0 deg around l = 0.0, b = 28.0.

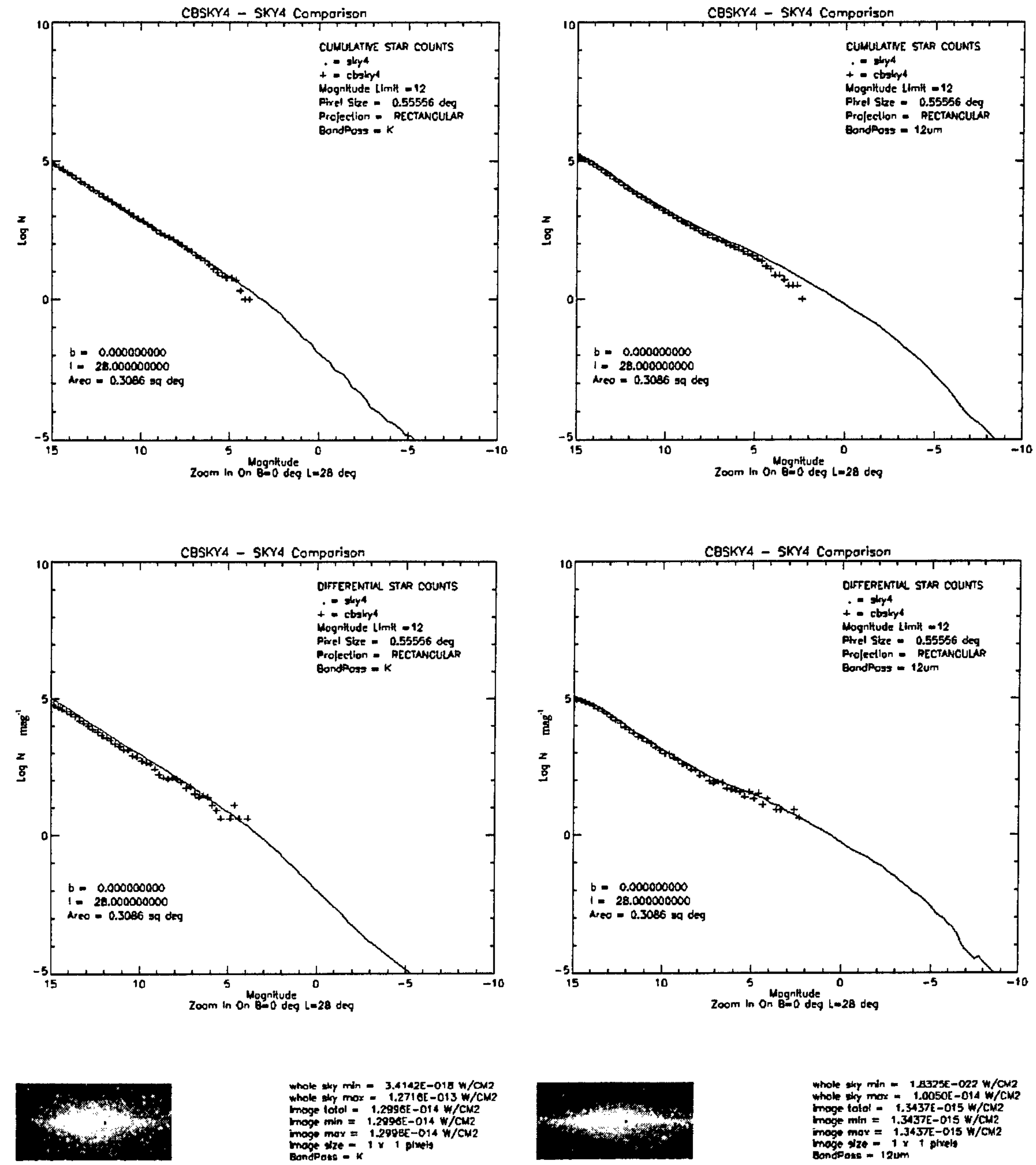


Figure C.44: SKY4 - CBSKY4 comparison for 0.556 deg around l = 0.0, b = 28.0.

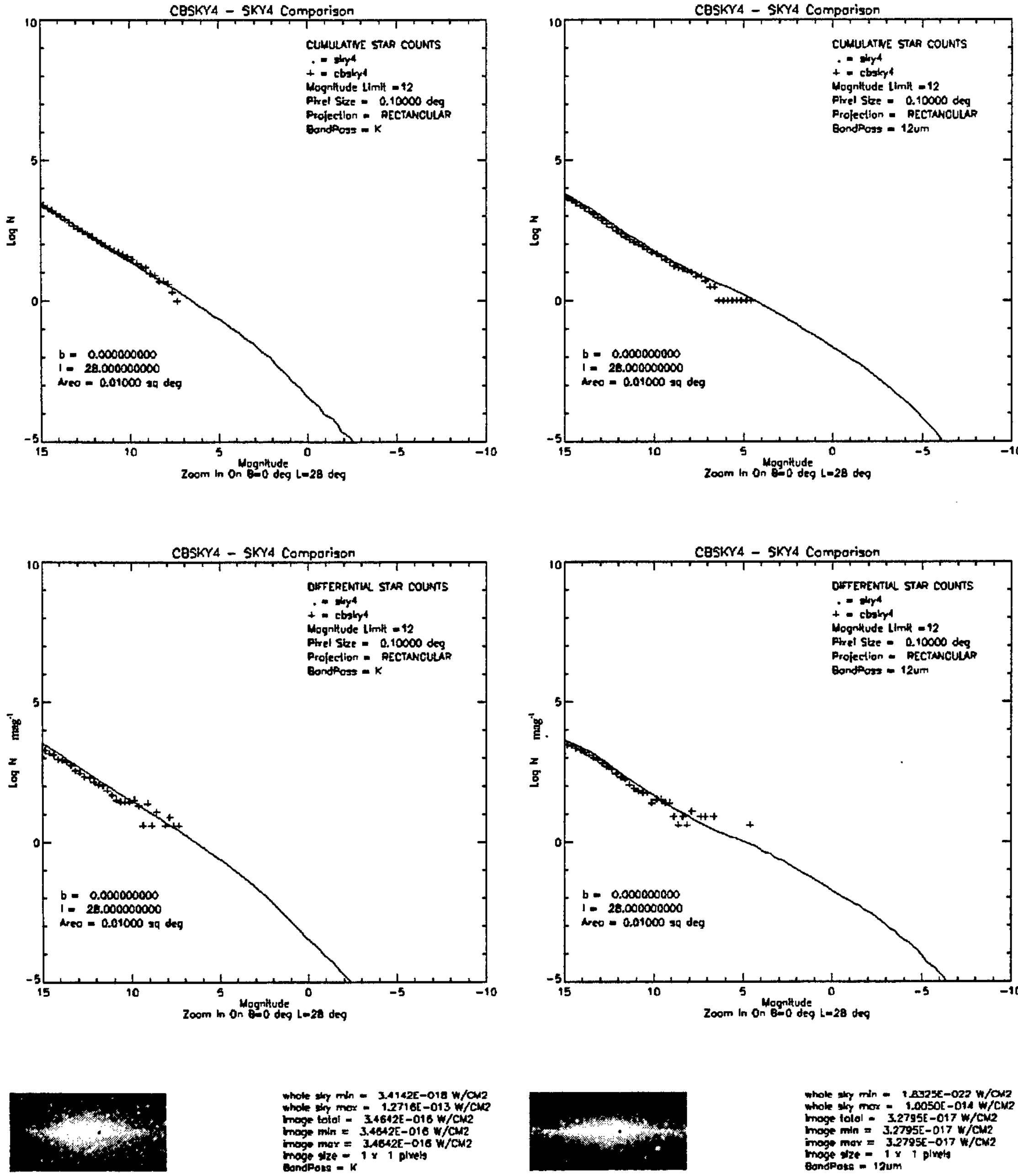


Figure C.45: SKY4 - CBSKY4 comparison for 0.1 deg around l = 0.0, b = 28.0.

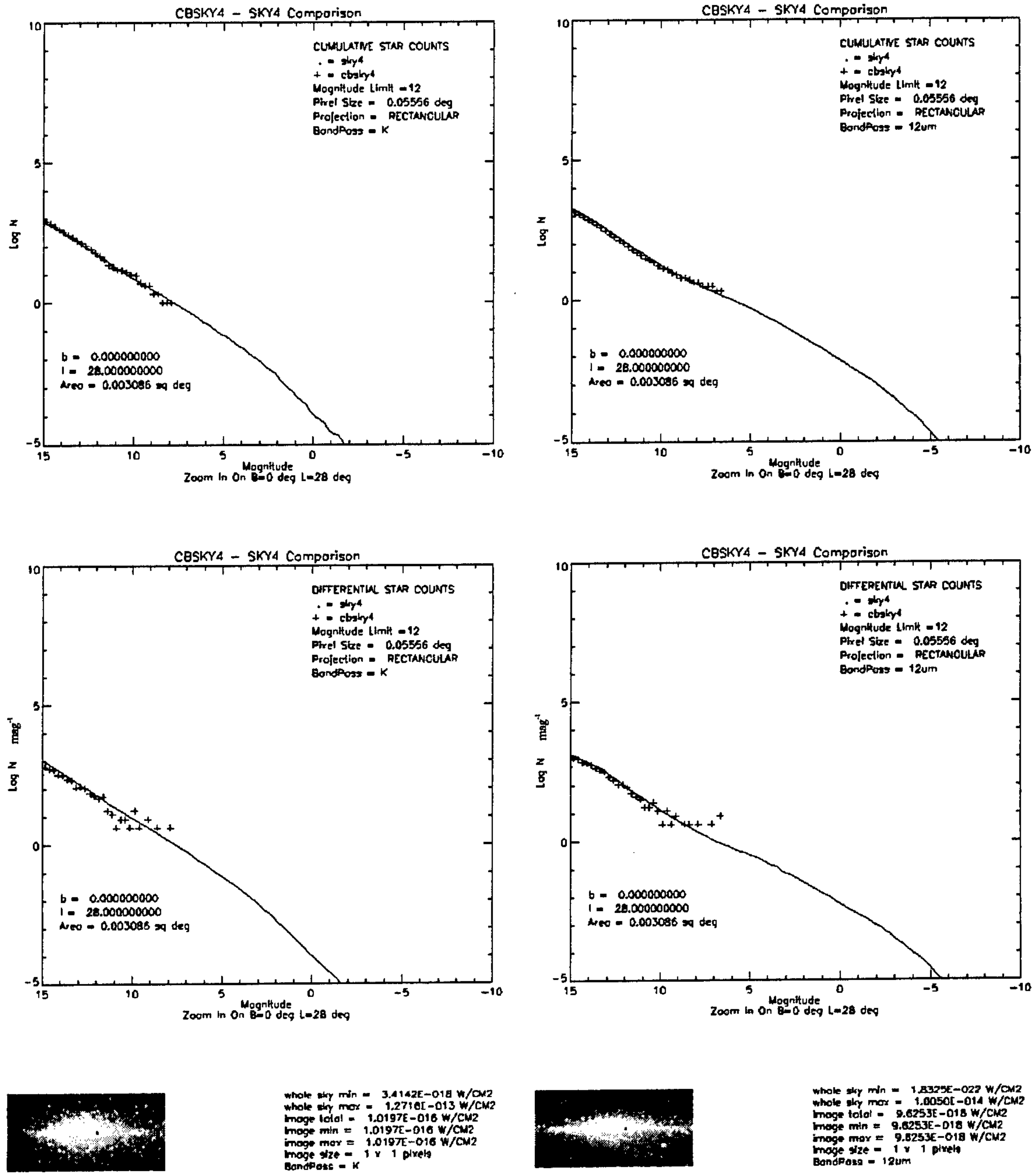


Figure C.46: SKY4 - CBSKY4 comparison for 0.0556 deg around l = 0.0, b = 28.0.

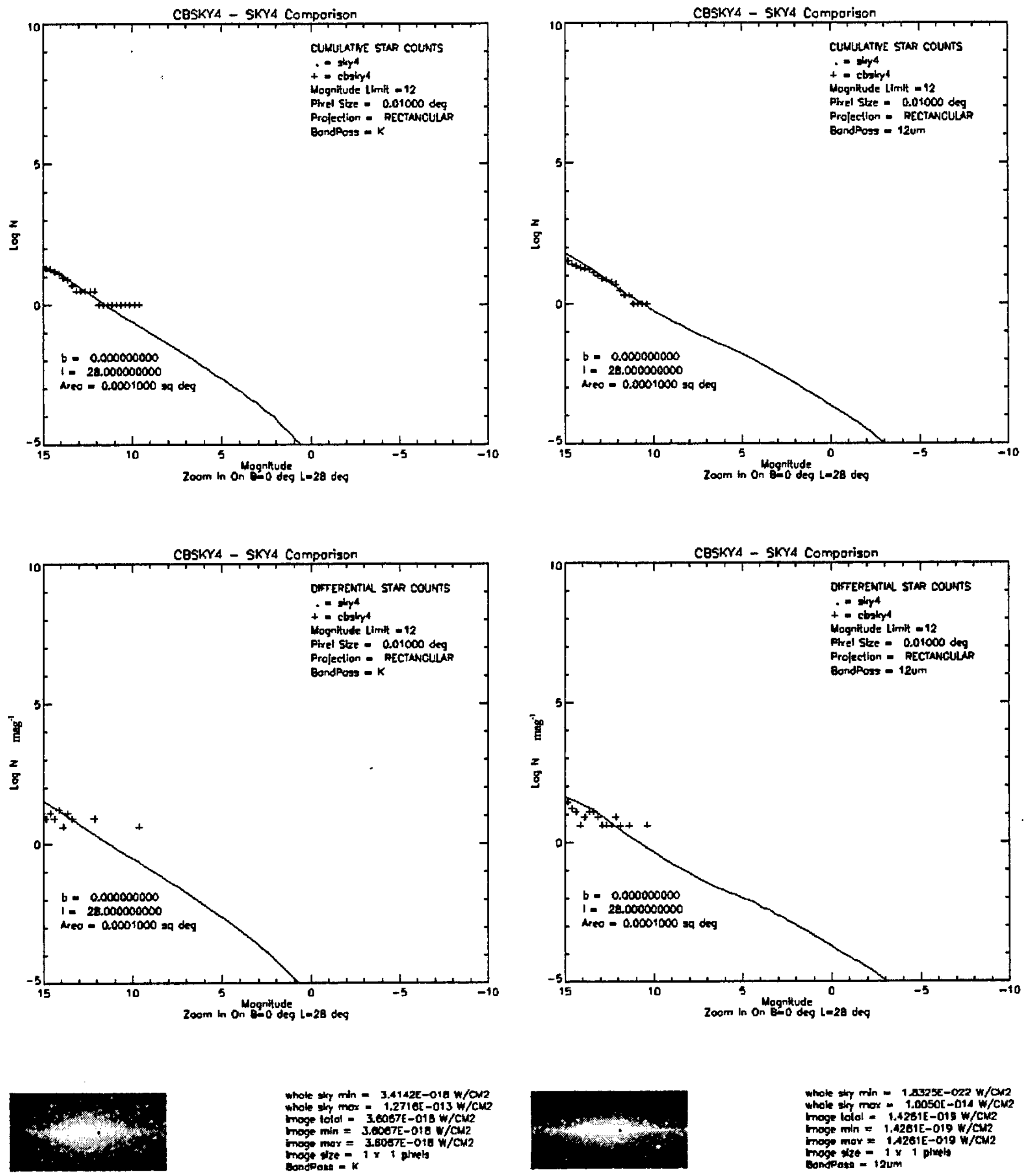


Figure C.47: SKY4 - CBSKY4 comparison for 0.01 deg around l = 0.0, b = 28.0.

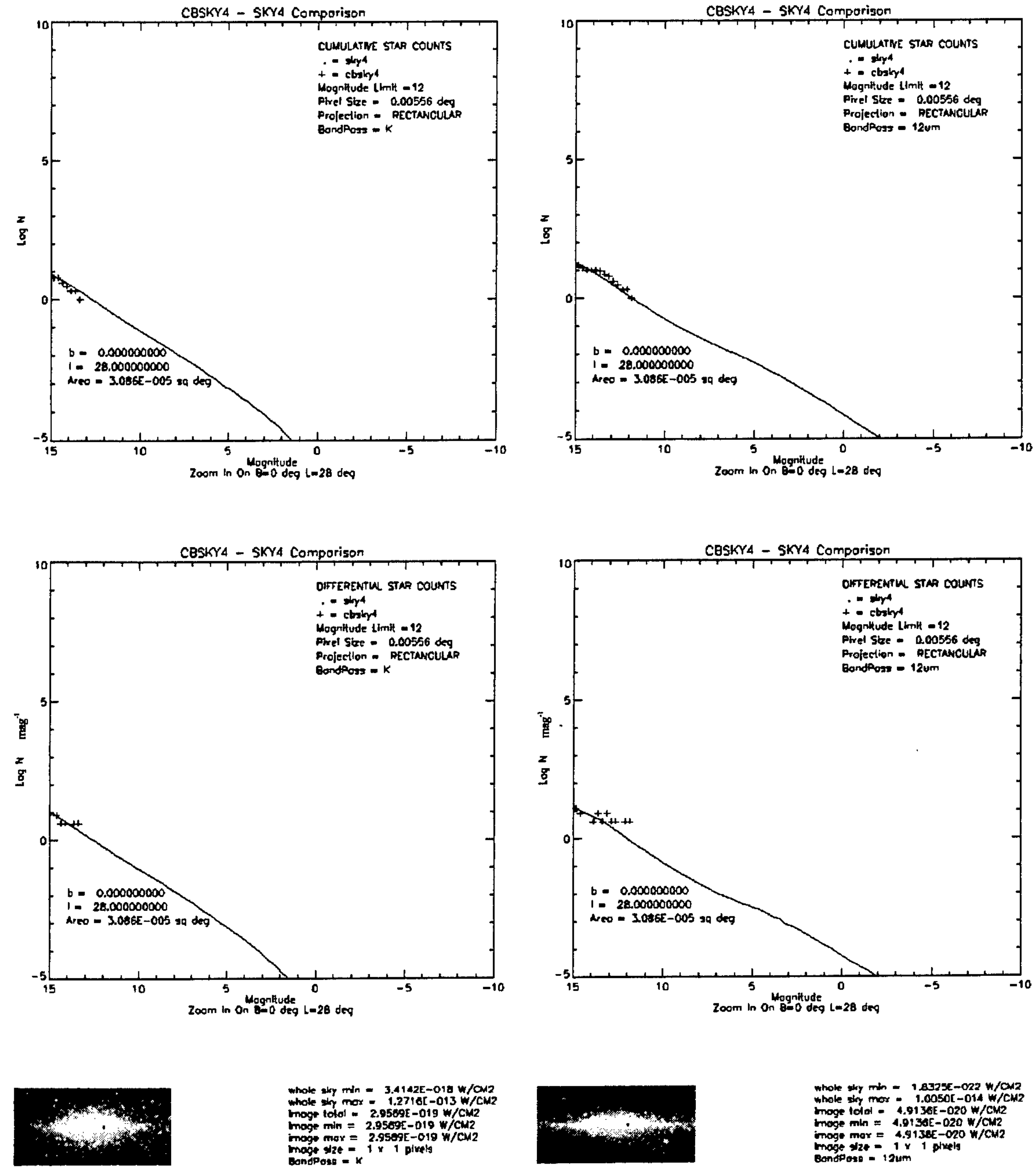


Figure C.48: SKY4 - CBSKY4 comparison for 0.00556 deg around l = 0.0, b = 28.0.

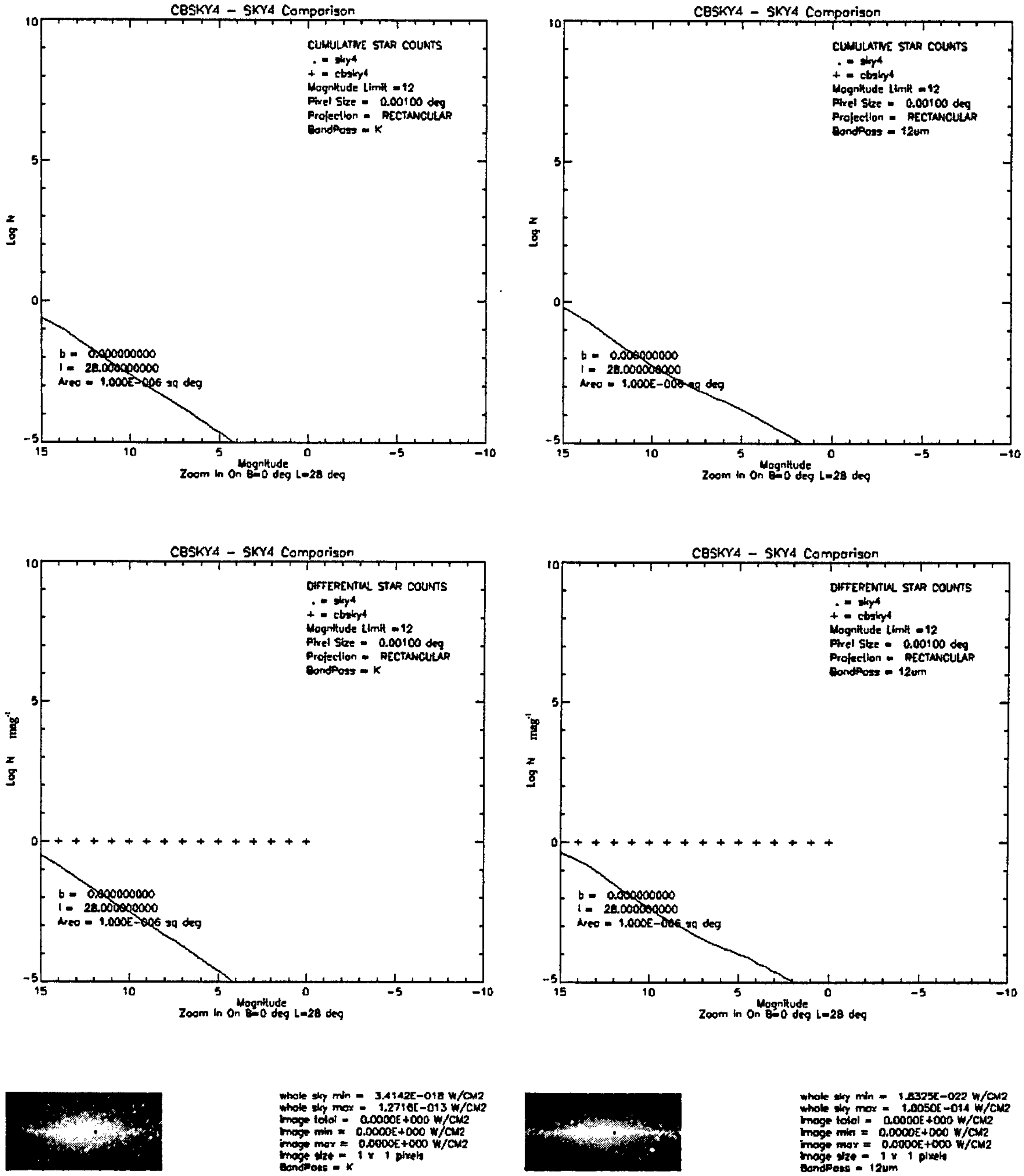


Figure C.49: SKY4 - CBSKY4 comparison for 0.001 deg around l = 0.0, b = 28.0.

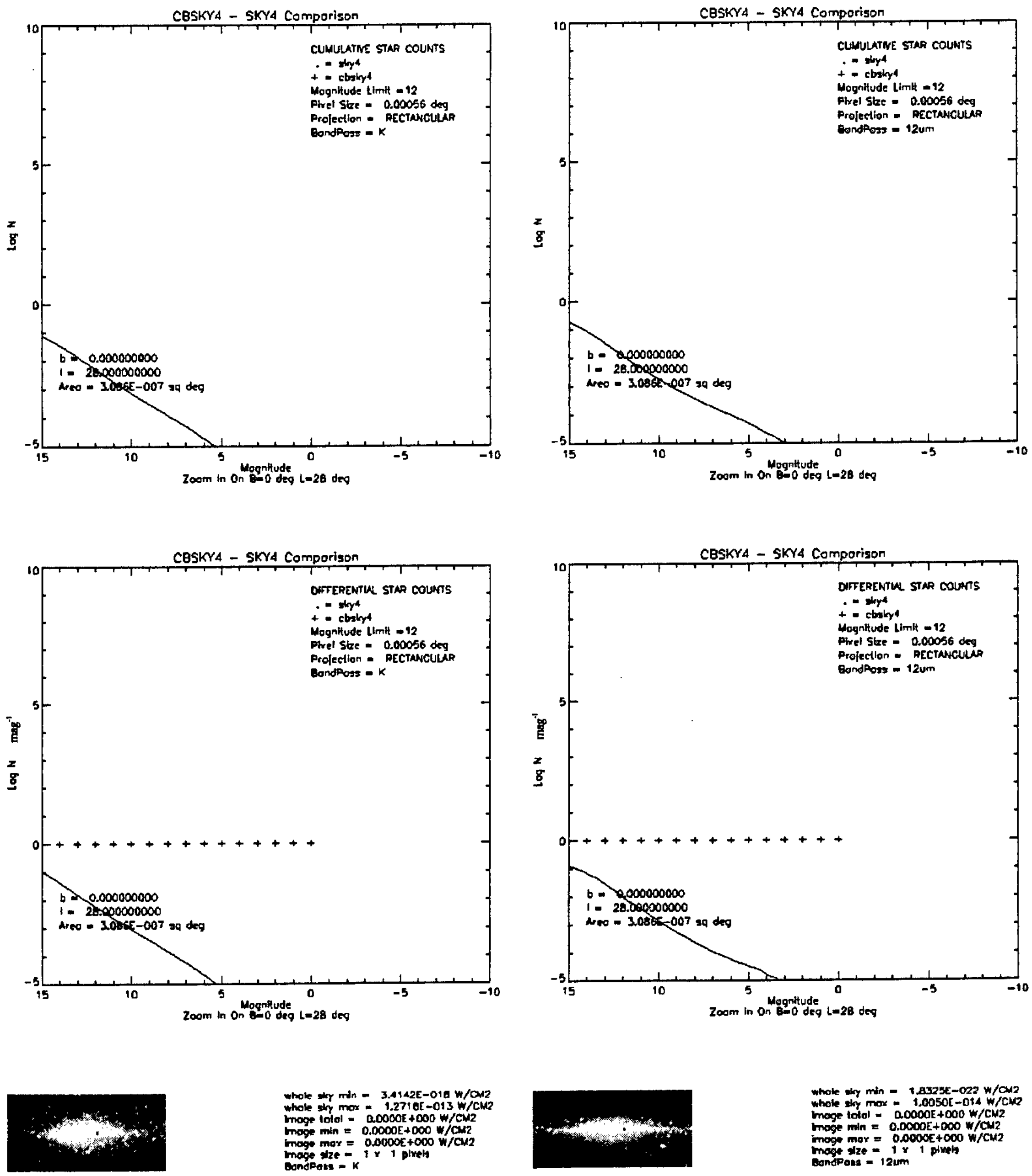


Figure C.50: SKY4 - CBSKY4 comparison for 0.000556 deg around l = 0.0, b = 28.0.

Appendix C.6

The region around l = 3 deg, b = 28 deg with the following pixel sizes (degrees) for Band K and 12μm:

10.0	5.56	1.0	0.556	0.10
0.0556	0.01	0.00556	0.001	0.000556

Table C.16: Interactive inputs used for the SKY4 runs around l =3.0, b = 28.0.

Value Used	Description
y	Keep solar displacement of 15 pc N of plane.
y	Integrate over area.
see table below	Limits of galactic latitude in degrees.
see table below	Limits of galactic longitude in degrees.
see table below	Incremental steps in latitude and longitude (in degrees).
n	No, don't print bright magnitudes-by-components information.
n	No, don't print surface brightness data.
n	No, don't bring back colors.
y	Yes, create LogN vs. LogS plots.
5 and 7	Use the pre-defined "12UM" bandpass (value = 7) and use the pre-defined "K" bandpass (value = 5) [This value is regressed upon, there are two separate SKY4 runs.]
y and n	Yes, plot the cumulative LogN on the y-axis, and no, plot the differential LogN on the y-axis. [This value is regressed upon, there are two separate SKY4 runs.]
y	Plot Magnitudes on x-axis.
n	No, don't plot observed points.

Table C.17: Region Definitions around l = 3.0, b = 28.0.

x_FOV (Deg)	Initial Latitude (Deg)	Final Latitude (Deg)	Initial Longitude (Deg)	Final Longitude (Deg)	Step Latitude (Deg)	Step Longitude (Deg)
1.00E+01	-2.00E+00	8.00E+00	2.30E+01	3.30E+01	1.00E+00	1.00E+00
5.56E+00	+2.22E-01	5.78E+00	2.52E+01	3.08E+01	5.56E-01	5.56E-01
1.00E+00	+2.50E+00	3.50E+00	2.75E+01	2.85E+01	1.00E-01	1.00E-01
5.56E-01	+2.72E+00	3.28E+00	2.77E+01	2.83E+01	5.56E-02	5.56E-02
1.00E-01	+2.95E+00	3.05E+00	2.80E+01	2.81E+01	1.00E-02	1.00E-02
5.56E-02	+2.97E+00	3.03E+00	2.80E+01	2.80E+01	5.56E-03	5.56E-03
1.00E-02	+3.00E+00	3.01E+00	2.80E+01	2.80E+01	1.00E-03	1.00E-03
5.56E-03	+3.00E+00	3.00E+00	2.80E+01	2.80E+01	5.56E-04	5.56E-04
1.00E-03	+3.00E+00	3.00E+00	2.80E+01	2.80E+01	1.00E-04	1.00E-04
5.56E-04	+3.00E+00	3.00E+00	2.80E+01	2.80E+01	5.56E-05	5.56E-05

Table C.18: CBSKY4 Inputs around l = 3.0, b = 28.0.

```
[Path]
architecture = DOS
path=\cbsd4\dataout\cbsky4\ZoomIn_B3_L
28_12um\
code_path=\cbsd4\cbsd\cbsky4
data_path=\cbsd4\cbsd\sky4data
verbose = YES

[cbsky4]
log_output = ZoomIn_P1.log
map = NO
real_stars = NO
statistical_stars = YES
clouds = YES
magnitude_limit = 15
seed = 346
method = CENTER
catalog = NO
catalog_limit = 10
nodesfile = NODE_IAH.DAT
elementsfile = ELEM_IAH.DAT
extinction = YES
count_statistics = YES
x-axis = MAGNITUDES
y-axis = Differential
errmap = NO
extmap = NO
spectral_type = 0

[convolution]
convolution = NO
point_spread_function = gaussian
psf_half_width = 1.01

[Image]
Image = YES
output_format = FITS
image_type=4-BYTE REAL
image_projection = RECTANGULAR
x_column_pixels = 1
y_row_pixels = 1
pixel_size = 10.0000000000000
image_center_longitude_degrees =
28.000000000
image_center_latitude = 3.000000000
units = W/CM2

[Positional]
observer_altitude = 0.0
observer_geographic_latitude = 0.0
observer_geographic_longitude = 0.0
Reference_Frame = B1950
coordinate_system = galactic
positions = apparent
Reference_system = geocentric

[spectral]
start_wavelength =12um
end_wavelength=12um

[Time]
observation_date=2 2 2000
observation_time=0 0 0.0
```

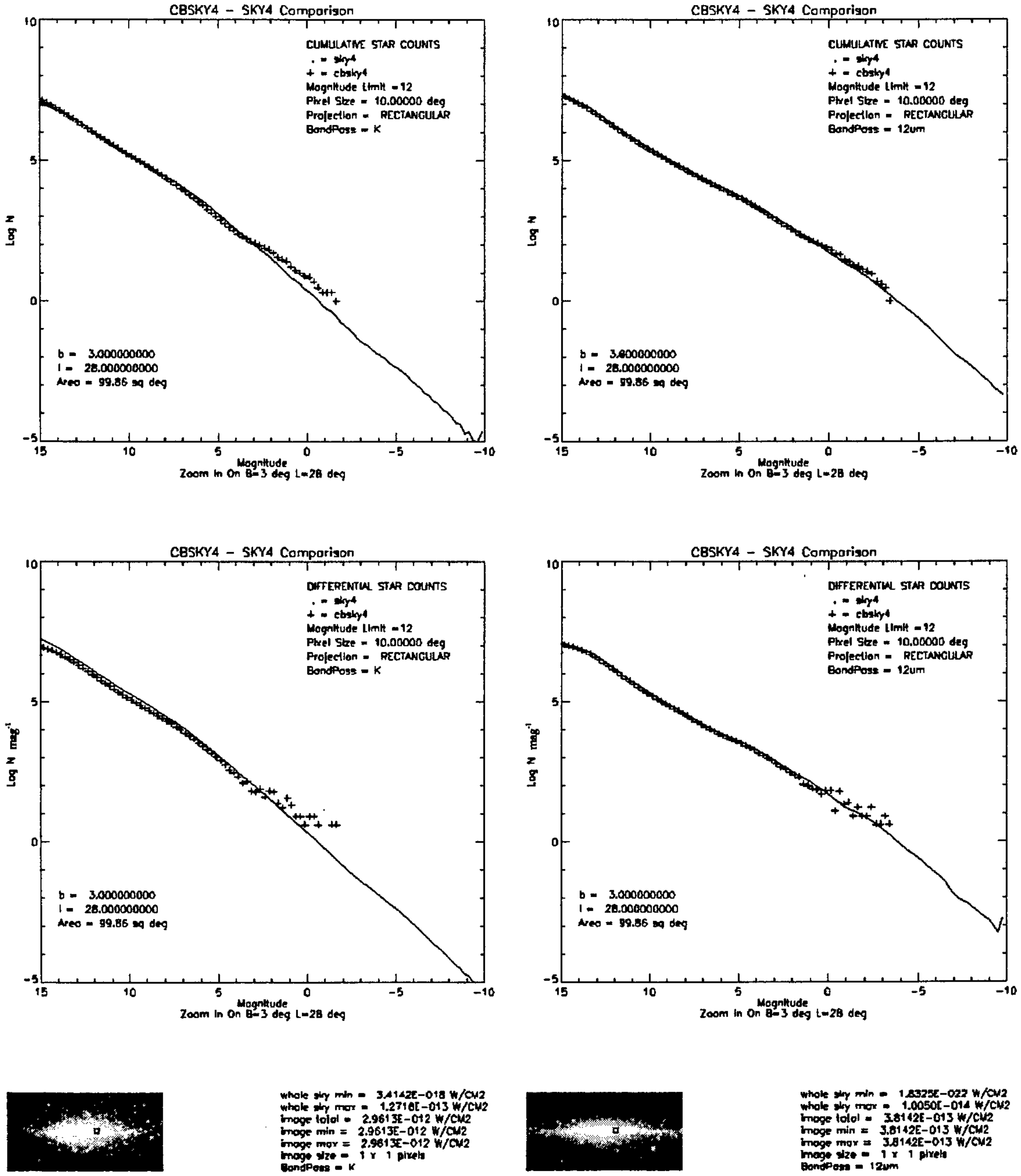


Figure C.51: SKY4 - CBSKY4 comparison for 10.0 deg around l = 3.0, b = 28.0.

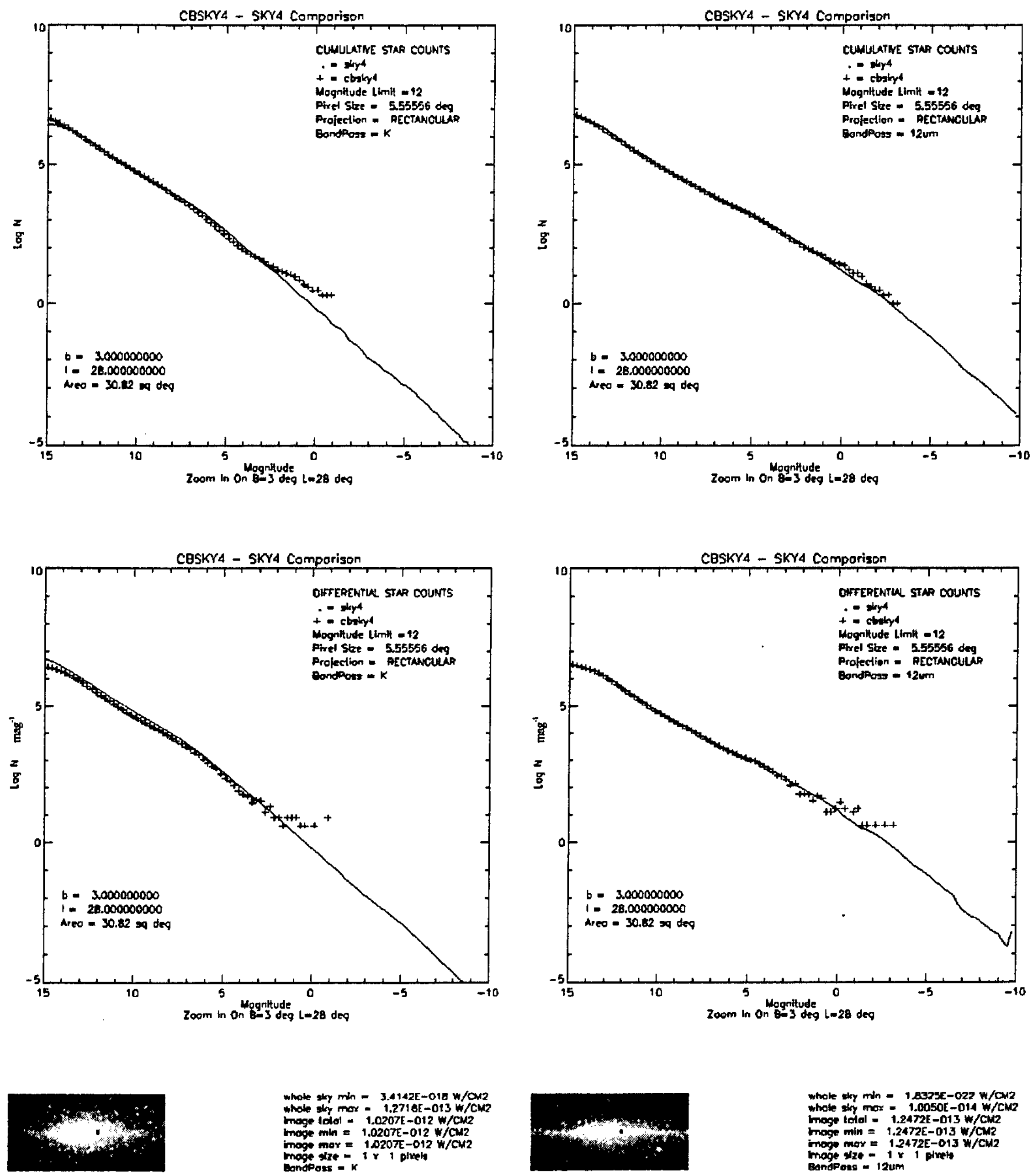


Figure C.52: SKY4 - CBSKY4 comparison for 5.56 deg around l = 3.0, b = 28.0.

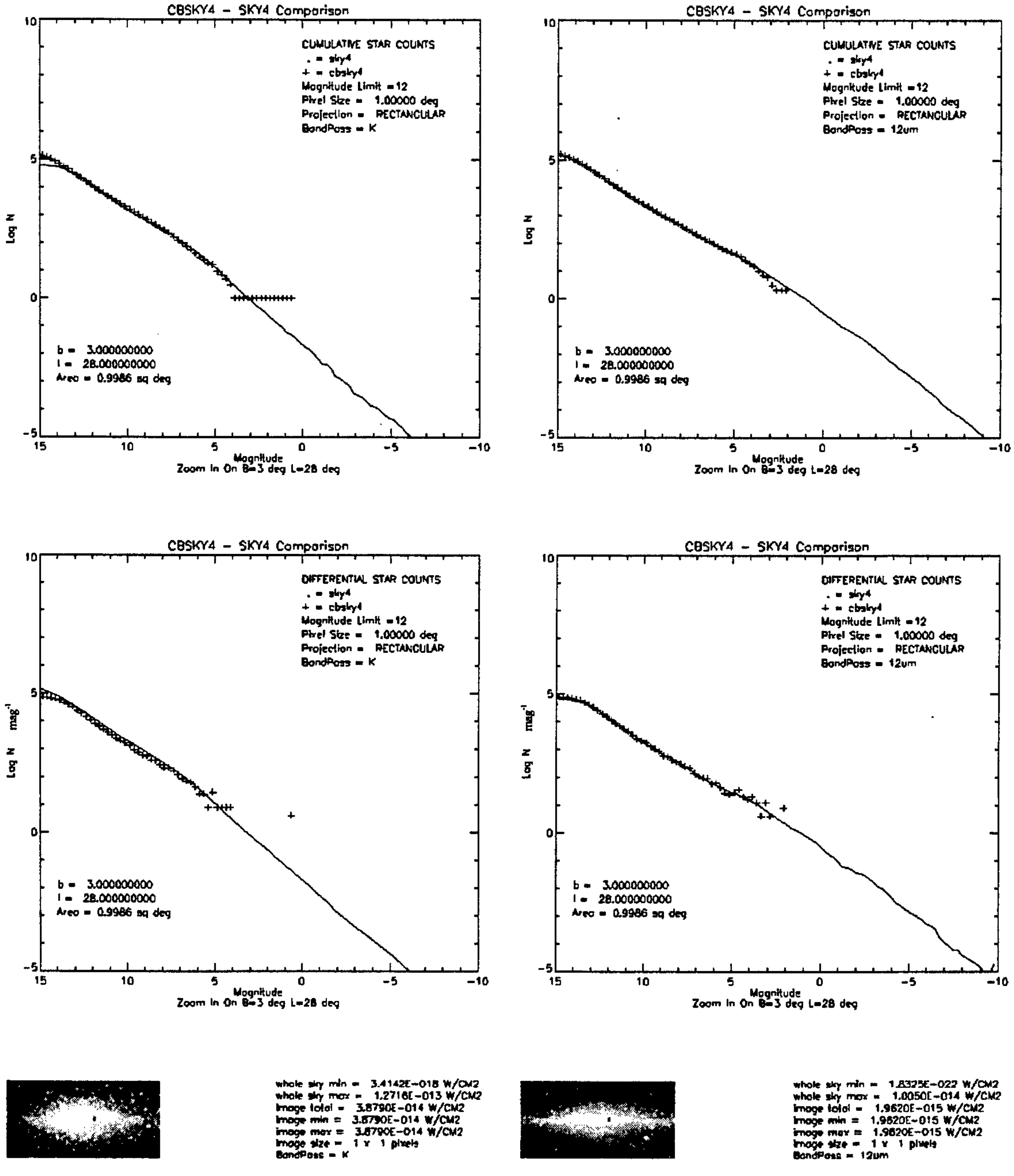


Figure C.53: SKY4 - CBSKY4 comparison for 1.0 deg around l = 3.0, b = 28.0.

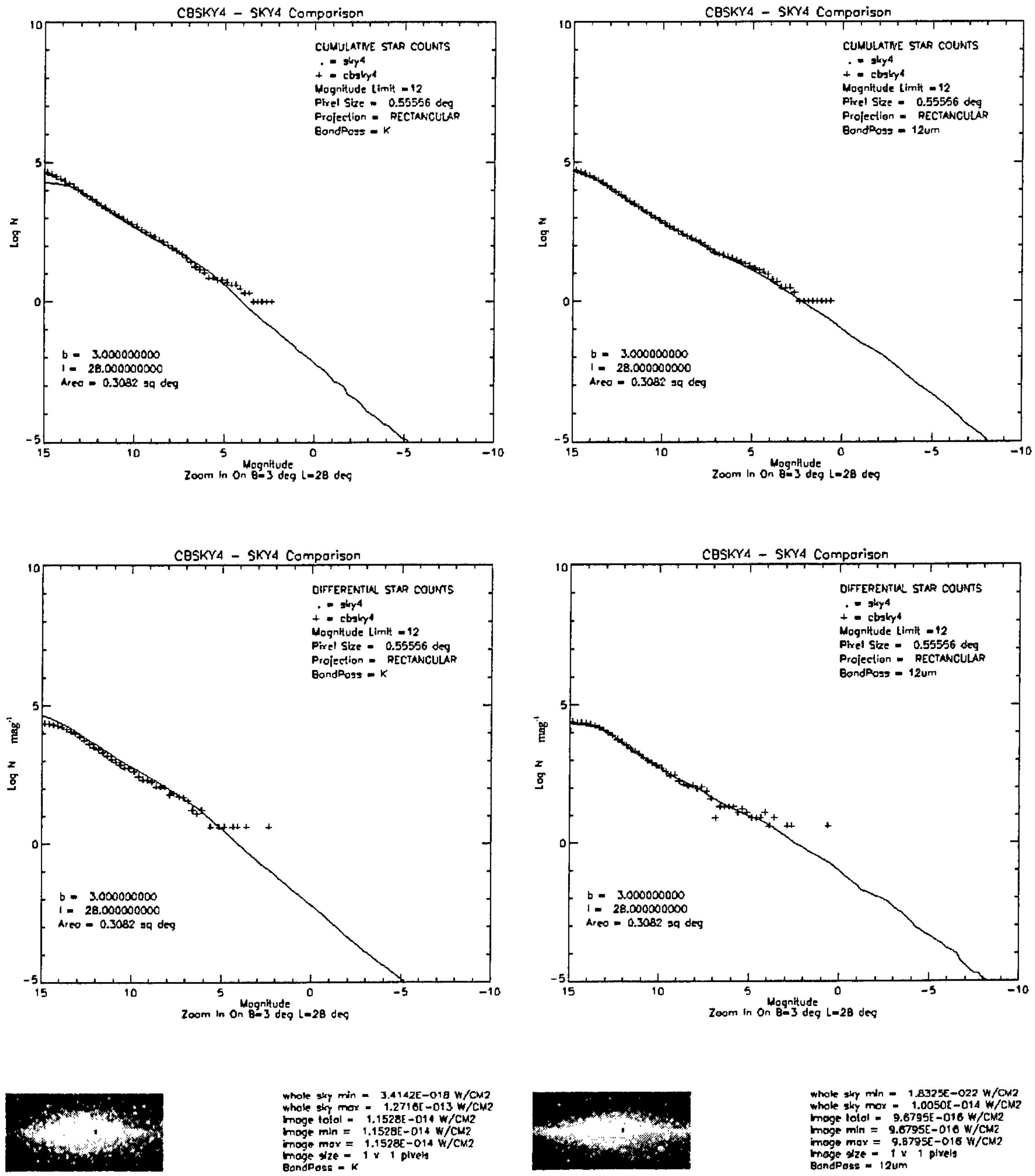


Figure C.54: SKY4 - CBSKY4 comparison for 0.556 deg around l = 3.0, b = 28.0.

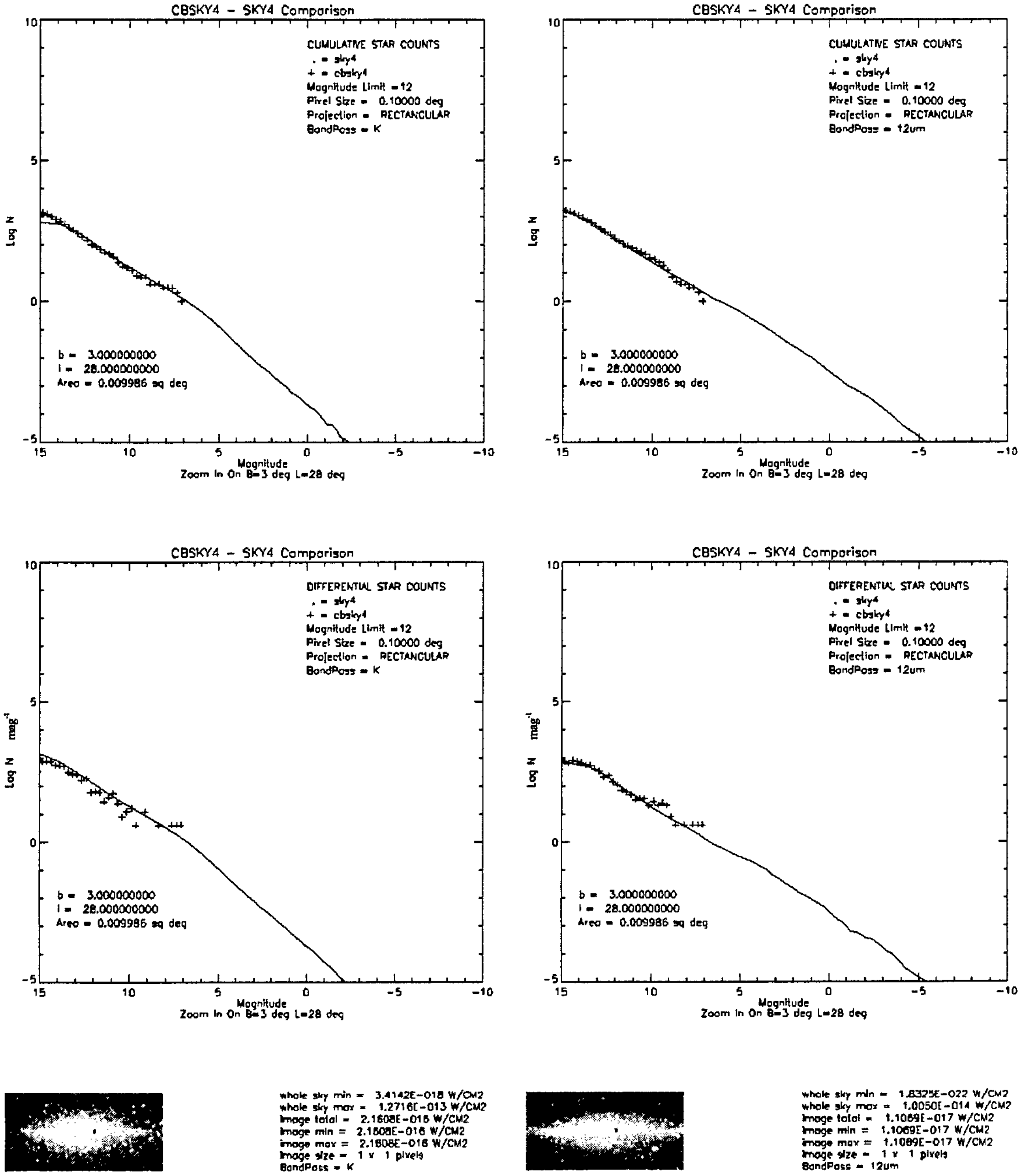


Figure C.55: SKY4 - CBSKY4 comparison for 0.1 deg around l = 3.0, b = 28.0.

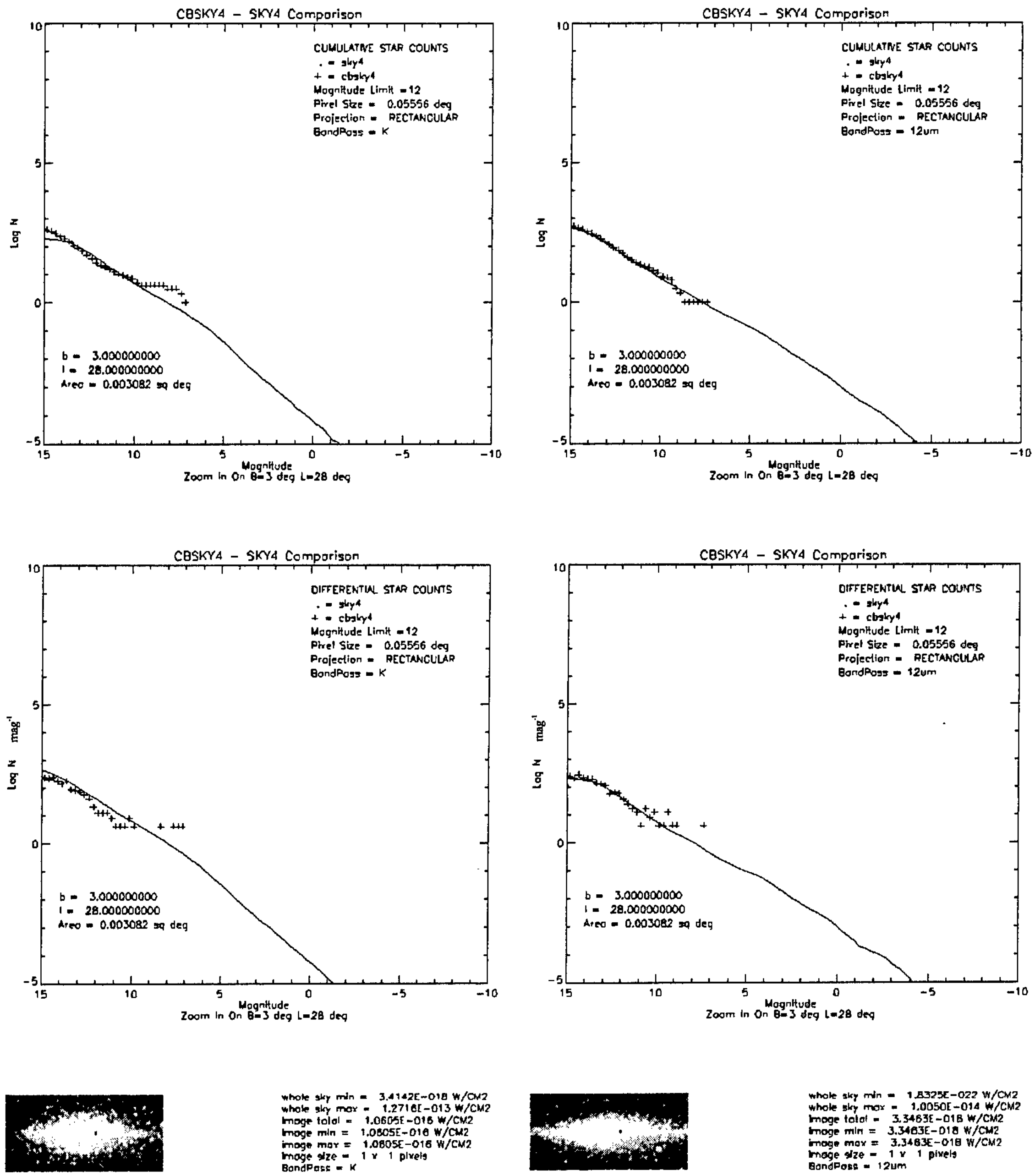
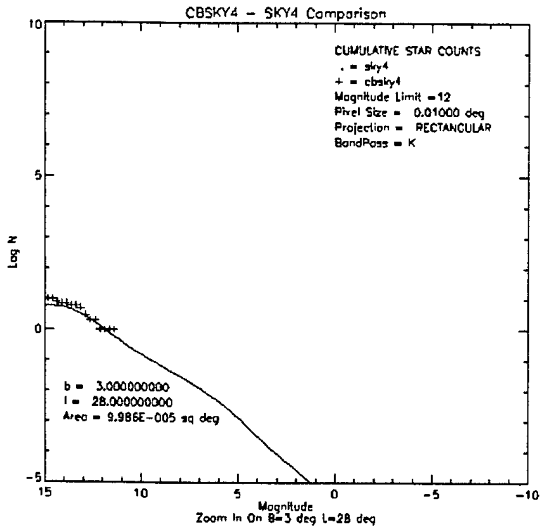
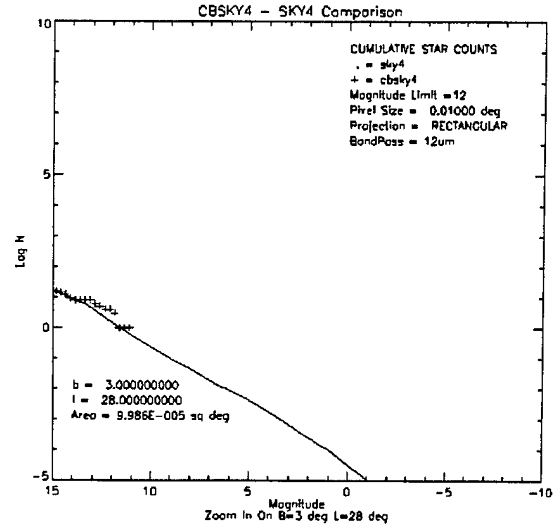
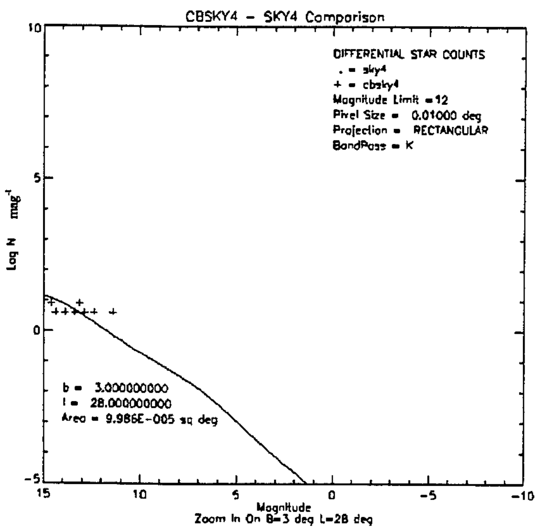
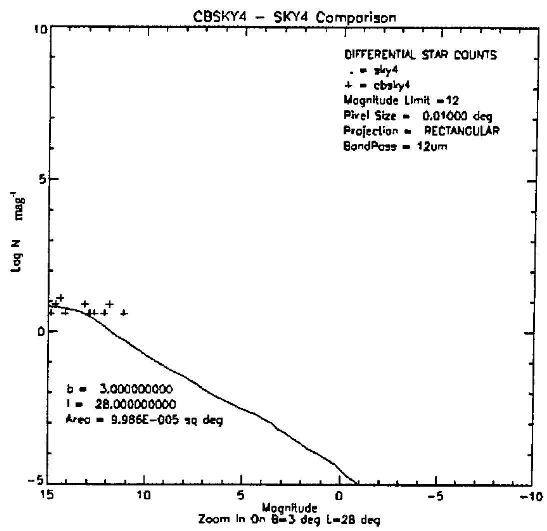


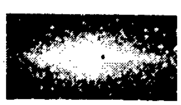
Figure C.56: SKY4 - CBSKY4 comparison for 0.0556 deg around l = 3.0, b = 28.0.



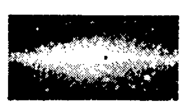








whole sky min = 3.4142E-018 W/CM2
whole sky max = 1.2716E-013 W/CM2
Image total = 1.2348E-018 W/CM2
Image min = 1.2348E-018 W/CM2
image max = 1.2348E-018 W/CM2
Image size = 1 x 1 pixels
BandPass = K



whole sky min = 1.8325E-022 W/CM2
whole sky max = 1.0050E-014 W/CM2
Image total = 7.5619E-020 W/CM2
Image min = 7.5619E-020 W/CM2
image max = 7.5819E-020 W/CM2
Image size = 1 x 1 pixels
BandPass = 12um

Figure C.57: SKY4 - CBSKY4 comparison for 0.01 deg around l = 3.0, b = 28.0.

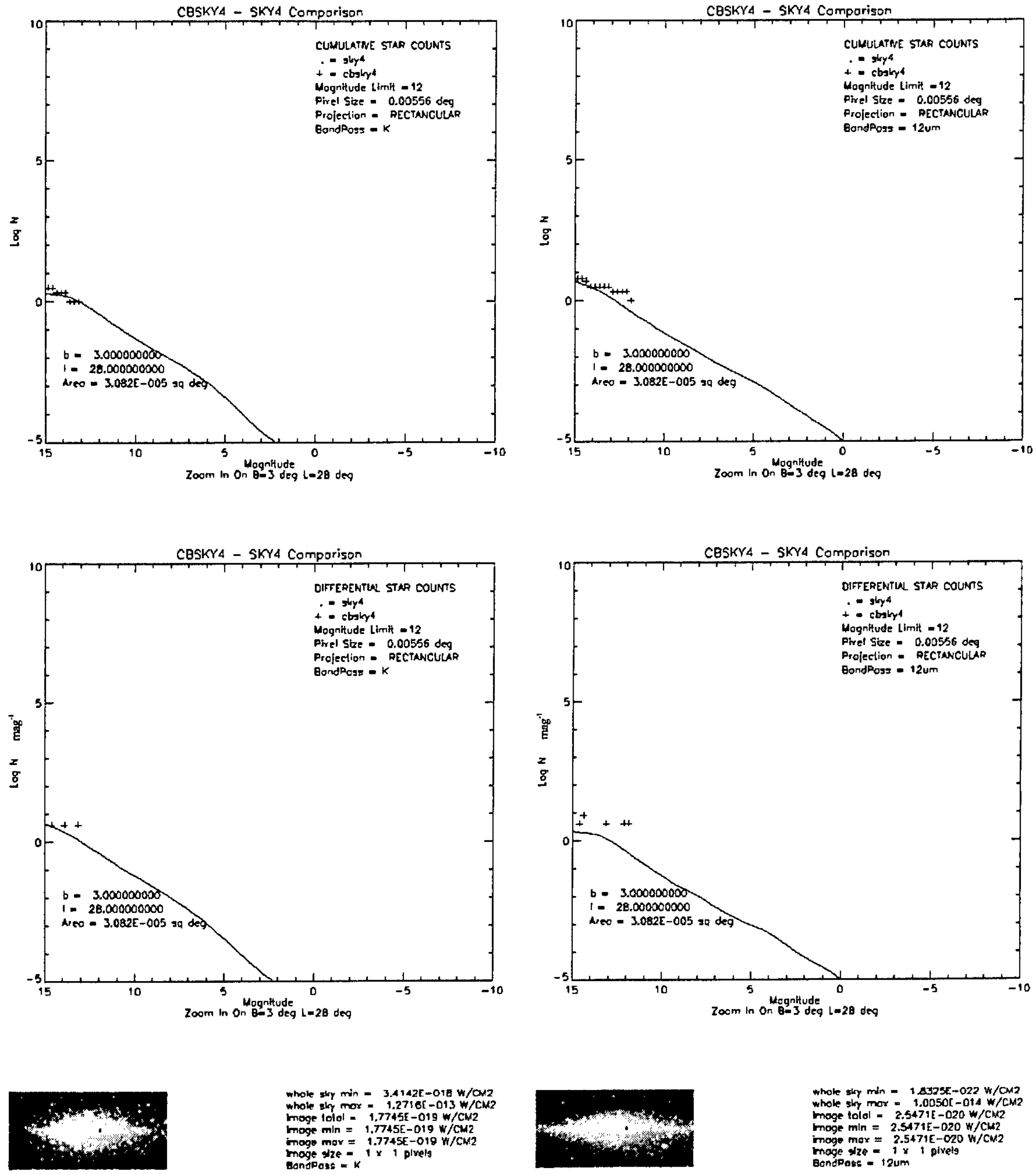


Figure C.58: SKY4 - CBSKY4 comparison for 0.00556 deg around l = 3.0, b = 28.0.

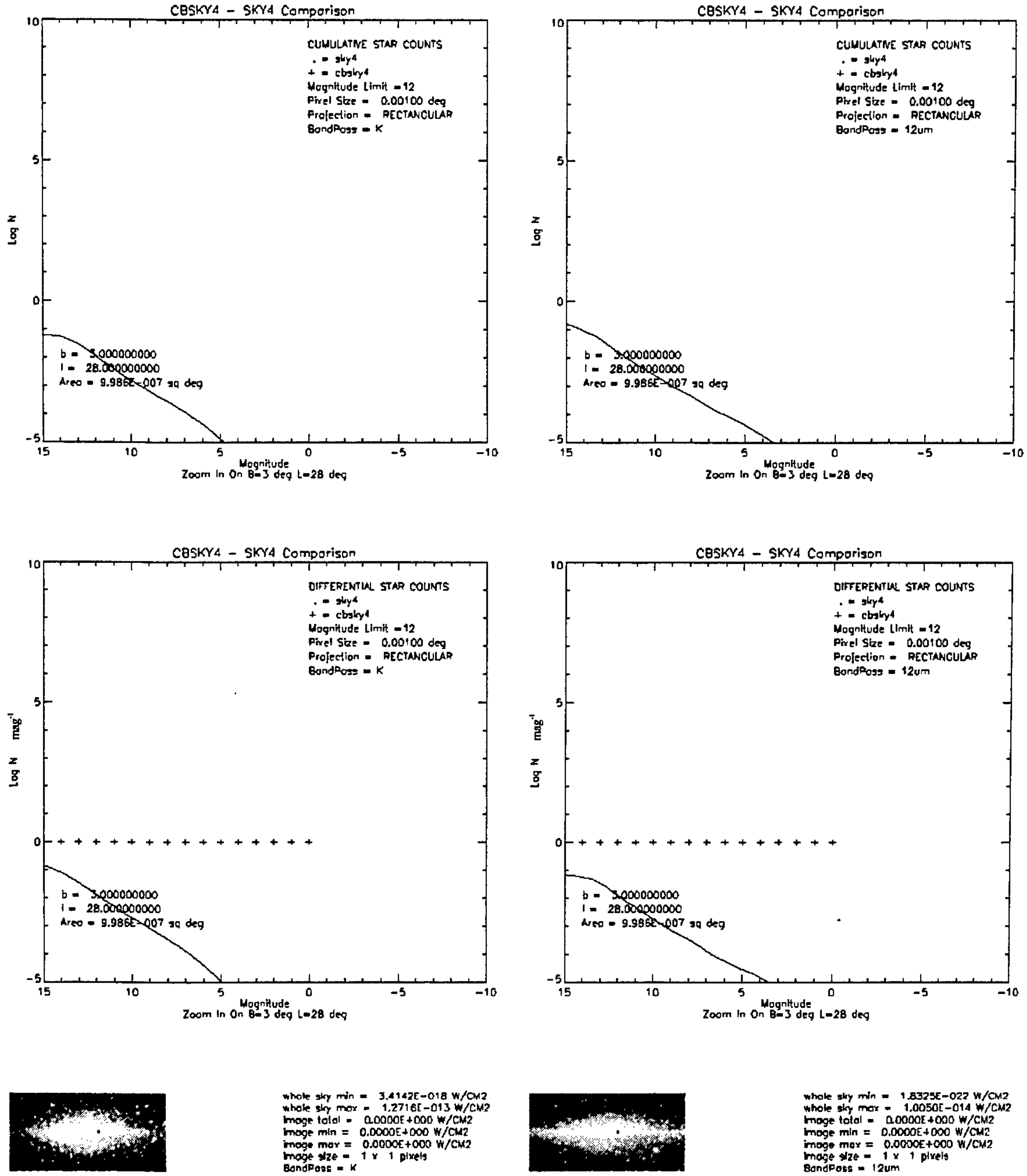
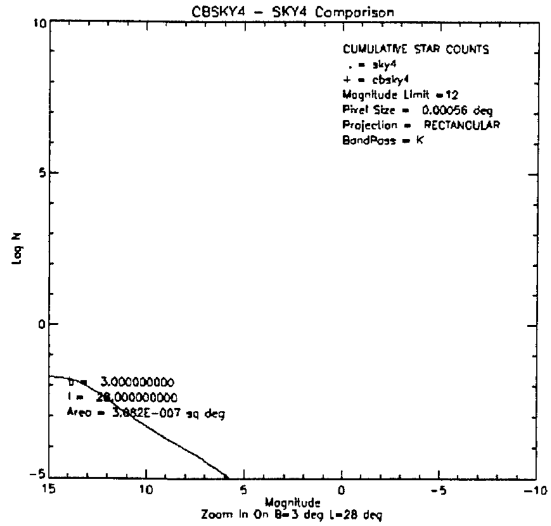
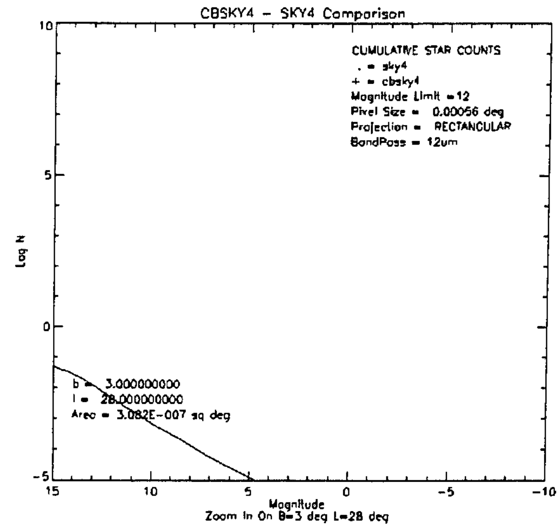
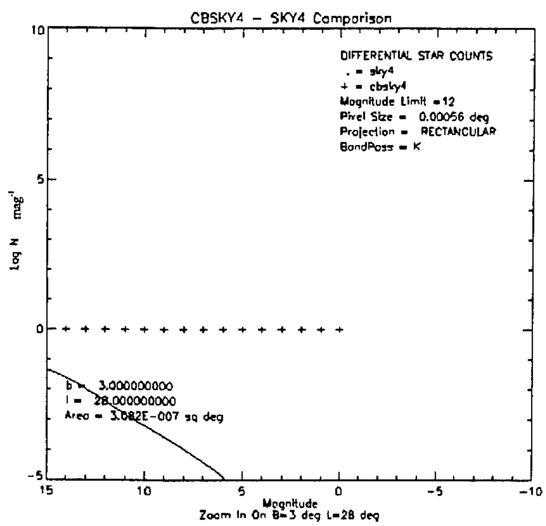
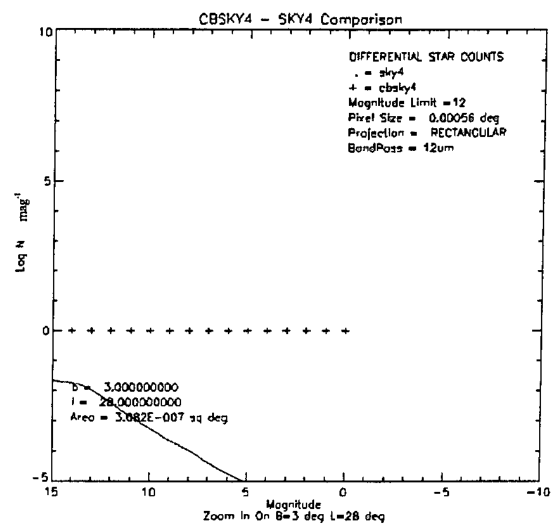


Figure C.59: SKY4 - CBSKY4 comparison for 0.001 deg around l = 3.0, b = 28.0.









whole sky min = 3.4142E-018 W/CM2
whole sky max = 1.2716E-013 W/CM2
image total = 0.0000E+000 W/CM2
image min = 0.0000E+000 W/CM2
image max = 0.0000E+000 W/CM2
image size = 1 x 1 pixels
BandPass = K

whole sky min = 1.8325E-022 W/CM2
whole sky max = 1.0050E-014 W/CM2
image total = 0.0000E+000 W/CM2
image min = 0.0000E+000 W/CM2
image max = 0.0000E+000 W/CM2
image size = 1 x 1 pixels
BandPass = 12um

Figure C.60: SKY4 - CBSKY4 comparison for 0.000556 deg around l = 3.0, b = 28.0.

Appendix D

Appendix D.1

The region around l = 90 deg, b = 0 deg with the following pixel sizes (degrees) for Band K and 12μm:

10.0 5.0 1.0 0.5

Table D.1: Interactive inputs used for the SKY4 runs around l =90.0, b =0.0.

Value Used	Description
y	Keep solar displacement of 15 pc N of plane.
y	Integrate over area.
see Table D.2	Limits of galactic latitude in degrees.
see Table D.2	Limits of galactic longitude in degrees.
see Table D.2	Incremental steps in latitude and longitude (in degrees).
n	No, don't print bright magnitudes-by-components information.
n	No, don't print surface brightness data.
n	No, don't bring back colors.
y	Yes, create LogN vs. LogS plots.
5 and 7	Use the pre-defined "12UM" bandpass (value = 7) and use the pre-defined "K" bandpass (value = 5) [This value is regressed upon, there are two separate SKY4 runs.]
y and n	Yes, plot the cumulative LogN on the y-axis, and no, plot the differential LogN on the y-axis. [This value is regressed upon, there are two separate SKY4 runs.]
y	Plot Magnitudes on x-axis.
n	No, don't plot observed points.

Table D.2: Region Definitions around l =90.0, b =0.0.

x_FOV (Deg)	Initial Latitude (Deg)	Final Latitude (Deg)	Initial Longitude (Deg)	Final Longitude (Deg)	Step Latitude (Deg)	Step Longitude (Deg)
1.00E+01	8.50E+01	9.50E+01	-5.00E+00	5.00E+00	1.00E+00	1.00E+00
5.00E+00	8.75E+01	9.25E+01	-2.50E+00	2.50E+00	5.00E-01	5.00E-01
1.00E+00	8.95E+01	9.05E+01	-5.00E-01	5.00E-01	1.00E-01	1.00E-01
5.00E-01	8.98E+01	9.03E+01	-2.50E-01	2.50E-01	5.00E-02	5.00E-02

Table D.3: CBSKY4 Inputs around l =90.0, b =0.0.

```
[Path]
architecture = DOS
path=\cbsd4\dataout\cbsky4\ZoomIn_B
90_L0_12um\
code_path=\cbsd4\cbsd\cbsky4
data_path=\cbsd4\cbsd\sky4data
verbose = YES

[cbsky4]
log_output = ZoomIn_P1.log
map = NO
real_stars = NO
statistical_stars = YES
clouds = YES
magnitude_limit = 15
seed = 346
method = CENTER
catalog = NO
catalog_limit = 10
nodesfile = NODE_IAH.DAT
elementsfile = ELEM_IAH.DAT
extinction = YES
count_statistics = YES
x-axis = MAGNITUDES
y-axis = Differential
errmap = NO
extmap = NO
spectral_type = 0

[convolution]
convolution = NO
point_spread_function = gaussian
psf_half_width = 1.01
```

```
[Image]
Image = YES
output_format = FITS
image_type=4-BYTE REAL
image_projection = RECTANGULAR
x_column_pixels = 256
y_row_pixels = 256
pixel_size = 0.0390625000000
image_center_longitude_degrees =
0.000000000
image_center_latitude =
90.000000000
units = W/CM2

[Positional]
observer_altitude = 0.0
observer_geographic_latitude = 0.0
observer_geographic_longitude = 0.0
Reference_Frame = B1950
coordinate_system = galactic
positions = apparent
Reference_system = geocentric

[spectral]
start_wavelength =12um
end_wavelength=12um

[Time]
observation_date=2 2 2000
observation_time=0 0 0.0
```

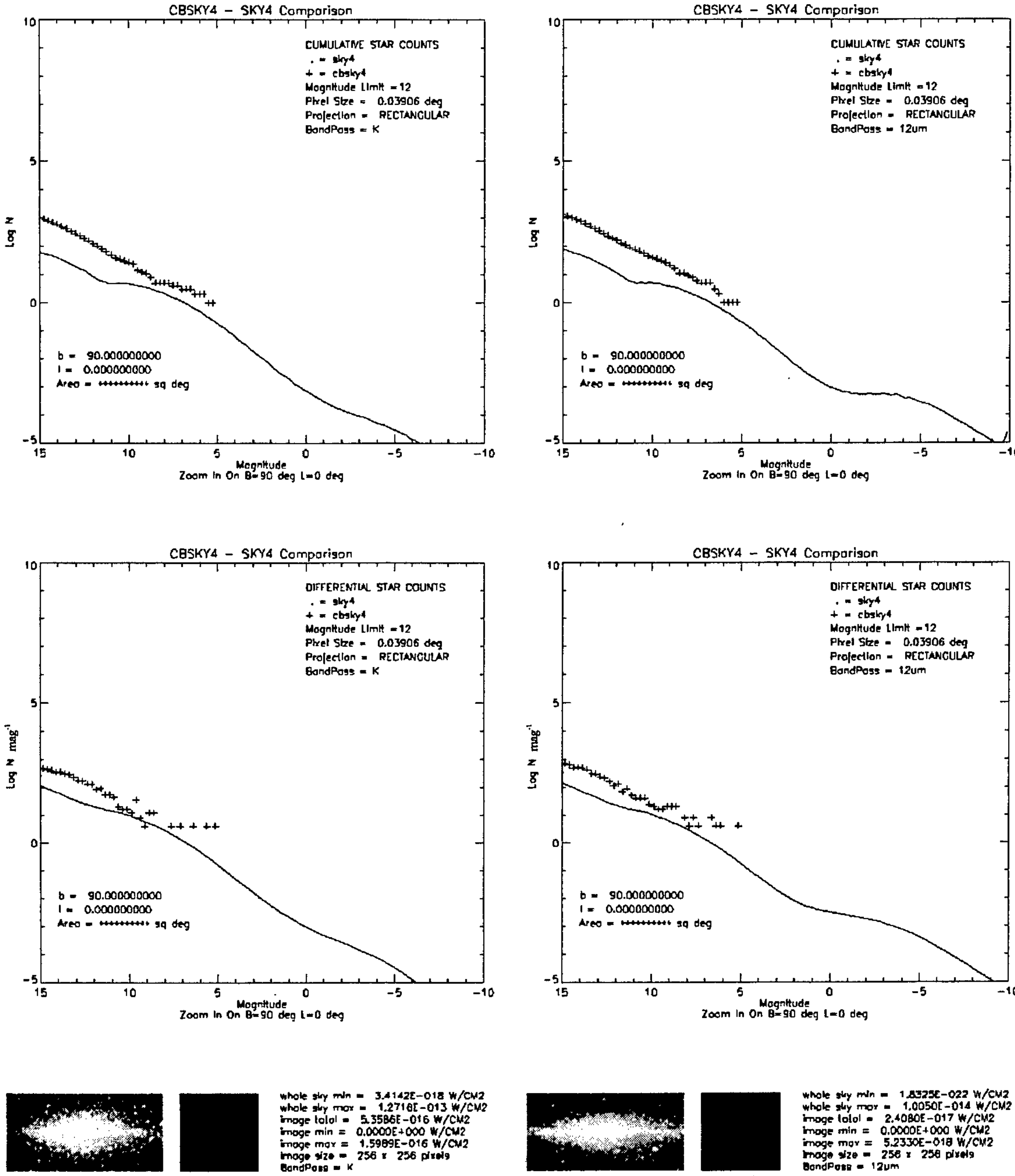


Figure D.1: SKY4 - CBSKY4 comparison for 10.0 deg around l =90.0, b =0.0.

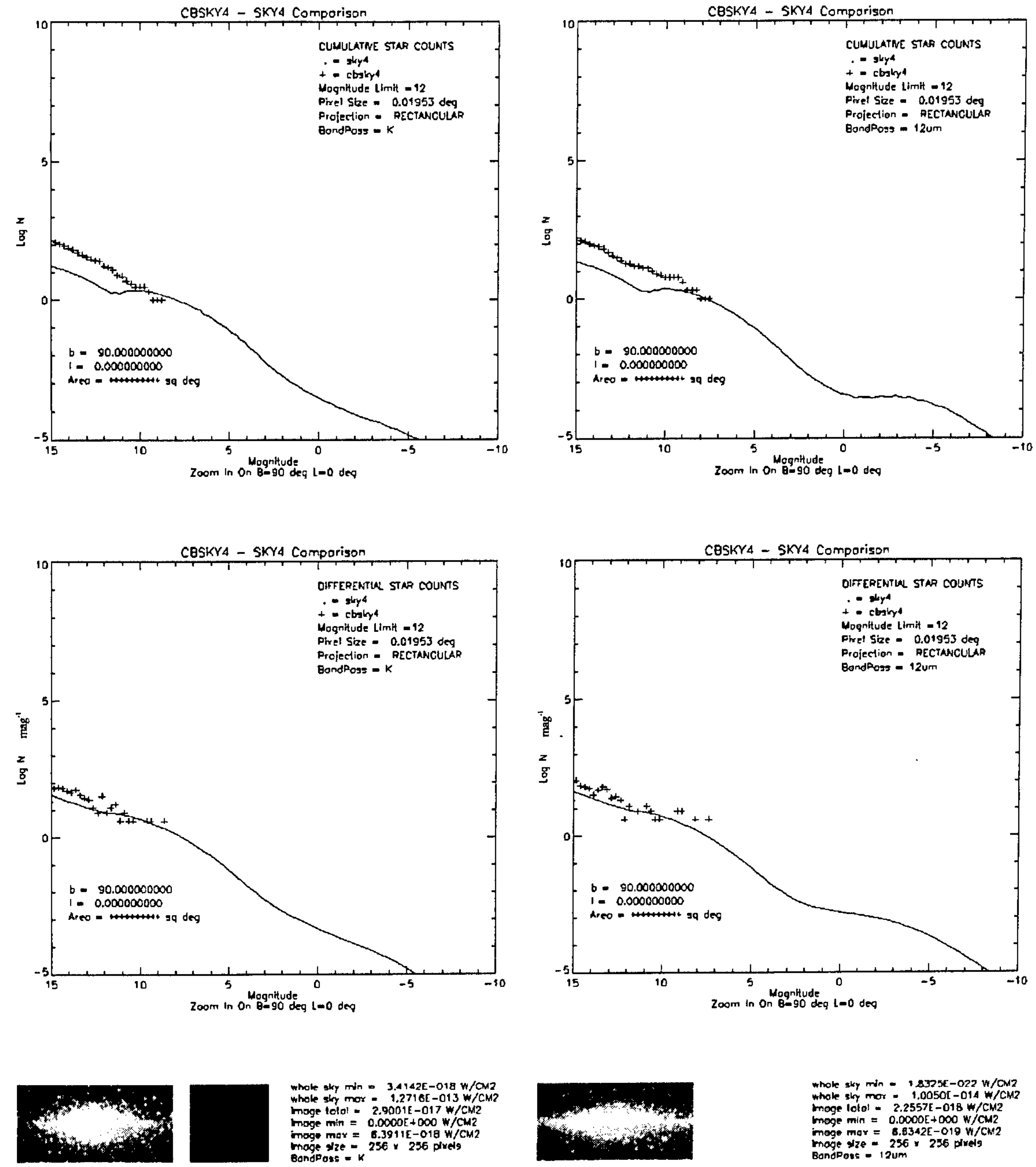


Figure D.2: SKY4 - CBSKY4 comparison for 5.0 deg around l =90.0, b =0.0.

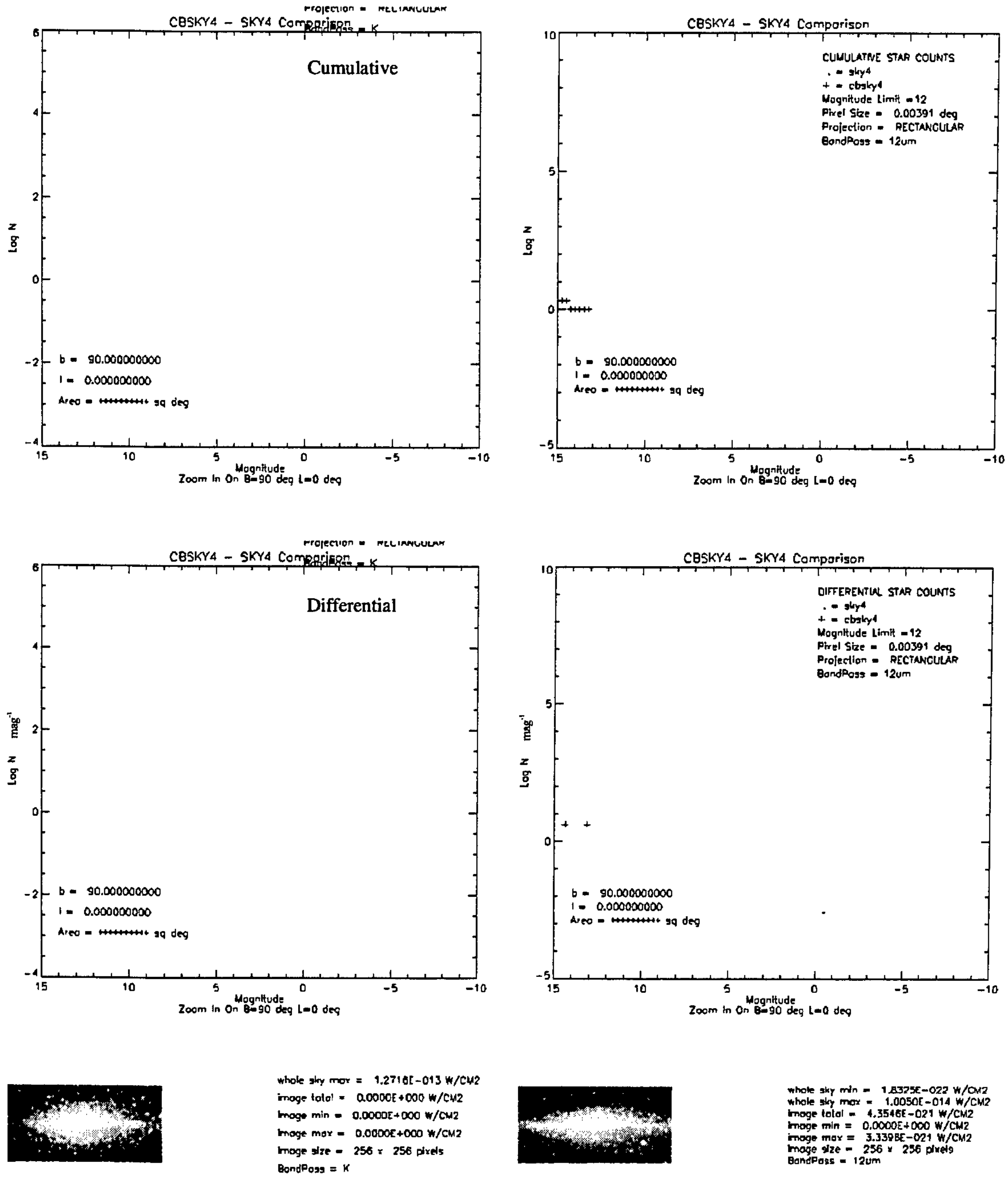


Figure D.3: SKY4 - CBSKY4 comparison for 1.0 deg around l =90.0, b =0.0.

Appendix D.2

The region around l = -90 deg, b = 0 deg with the following pixel sizes (degrees) for Band K and 12μm:

10.0	5.0	1.0	0.5

Table D.4: Interactive inputs used for the SKY4 runs around l =90.0, b =0.0.

Value Used	Description
y	Keep solar displacement of 15 pc N of plane.
y	Integrate over area.
see Table D.5	Limits of galactic latitude in degrees.
see Table D.5	Limits of galactic longitude in degrees.
see Table D.5	Incremental steps in latitude and longitude (in degrees).
n	No, don't print bright magnitudes-by-components information.
n	No, don't print surface brightness data.
n	No, don't bring back colors.
y	Yes, create LogN vs. LogS plots.
5 and 7	Use the pre-defined "12UM" bandpass (value = 7) and use the pre-defined "K" bandpass (value = 5) [This value is regressed upon, there are two separate SKY4 runs.]
y and n	Yes, plot the cumulative LogN on the y-axis, and no, plot the differential LogN on the y-axis. [This value is regressed upon, there are two separate SKY4 runs.]
y	Plot Magnitudes on x-axis.
n	No, don't plot observed points.

Table D.5: Region Definitions around l =90.0, b =0.0.

x_FOV (Deg)	Initial Latitude (Deg)	Final Latitude (Deg)	Initial Longitude (Deg)	Final Longitude (Deg)	Step Latitude (Deg)	Step Longitude (Deg)
1.00E+01	-9.50E+01	-8.50E+01	-5.00E+00	5.00E+00	1.00E+00	1.00E+00
5.00E+00	-9.25E+01	-8.75E+01	-2.50E+00	2.50E+00	5.00E-01	5.00E-01
1.00E+00	-9.05E+01	-8.95E+01	-5.00E-01	5.00E-01	1.00E-01	1.00E-01
5.00E-01	-9.03E+01	-8.98E+01	-2.50E-01	2.50E-01	5.00E-02	5.00E-02

Table D.6: CBSKY4 Inputs around l =90.0, b =0.0.

```
[Path]
architecture = DOS
path=\cbsd4\dataout\cbsky4\ZoomIn_B-
90_L0_12um\
code_path=\cbsd4\cbsd\cbsky4
data_path=\cbsd4\cbsd\sky4data
verbose = YES

[cbsky4]
log_output = ZoomIn_P1.log
map = NO
real_stars = NO
statistical_stars = YES
clouds = YES
magnitude_limit = 15
seed = 346
method = CENTER
catalog = NO
catalog_limit = 10
nodesfile = NODE_IAH.DAT
elementsfile = ELEM_IAH.DAT
extinction = YES
count_statistics = YES
x-axis = MAGNITUDES
y-axis = Differential
errmap = NO
extmap = NO
spectral_type = 0

[convolution]
convolution = NO
point_spread_function = gaussian
psf_half_width = 1.01
```

```
[Image]
Image = YES
output_format = FITS
image_type=4-BYTE REAL
image_projection = RECTANGULAR
x_column_pixels = 256
y_row_pixels = 256
pixel_size = 0.0390625000000
image_center_longitude_degrees =
0.000000000
image_center_latitude = -90.000000000
units = W/CM2

[Positional]
observer_altitude = 0.0
observer_geographic_latitude = 0.0
observer_geographic_longitude = 0.0
Reference_Frame = B1950
coordinate_system = galactic
positions = apparent
Reference_system = geocentric

[spectral]
start_wavelength =12um
end_wavelength=12um

[Time]
observation_date=2 2 2000
observation_time=0 0 0.0
```

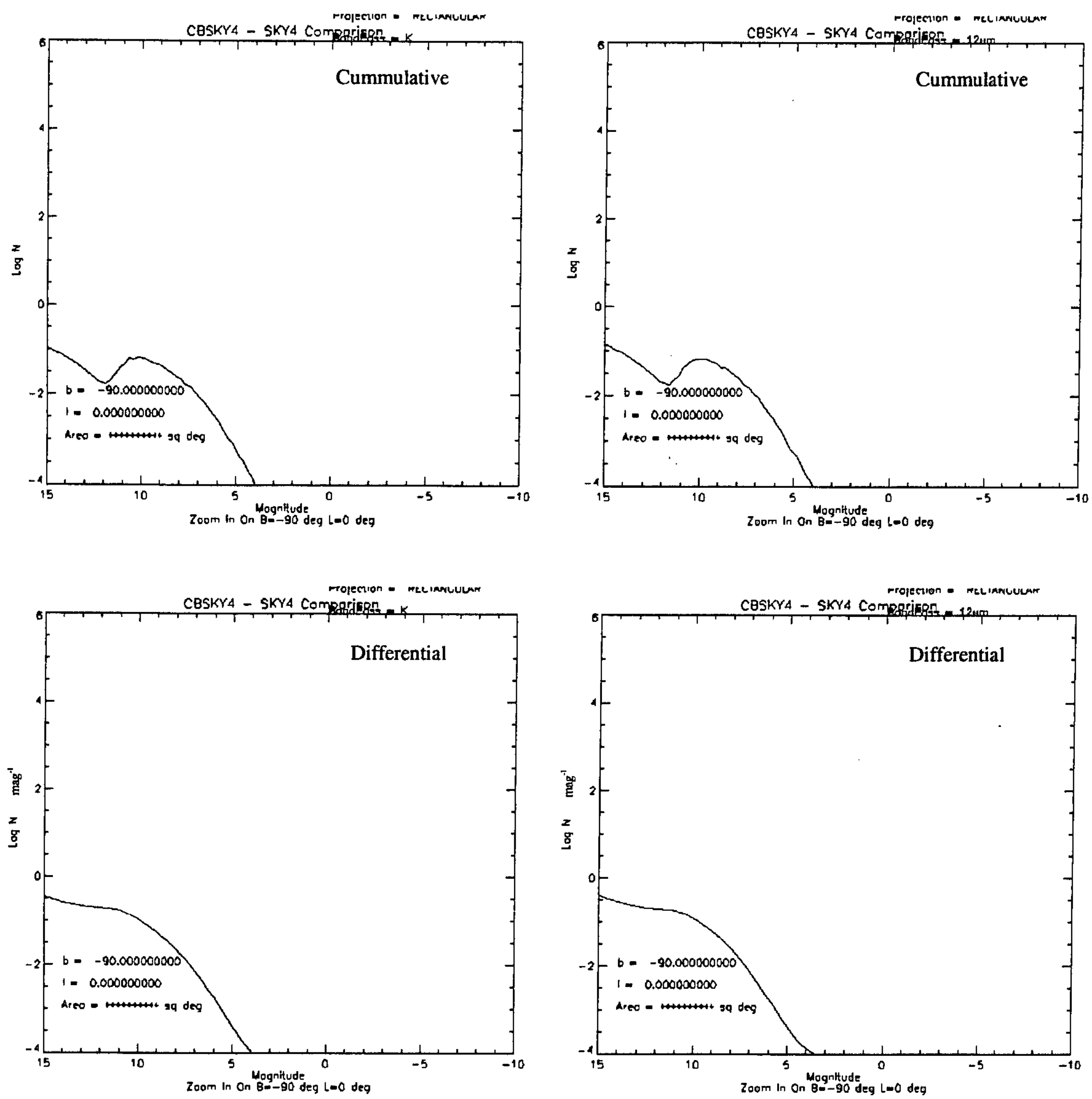


Figure D.4: At the largest IFOV size, there were only fractional stars at the Galactic South Pole.

Appendix E

Appendix E.1

The region around l = -32 deg, b = 281 deg (the Large Magellanic Cloud) with the following pixel sizes (degrees) for Band K and 12μm:

10.0	5.56	1.0	0.556	0.10
0.0556	0.01	0.00556	0.001	0.000556

Table E.1: Interactive inputs used for the SKY4 runs around the LMC.

Value Used	**Description**
y	Keep solar displacement of 15 pc N of plane.
y	Integrate over area.
See Table E.2	Limits of galactic latitude in degrees.
See Table E.2	Limits of galactic longitude in degrees.
See Table E.2	Incremental steps in latitude and longitude (in degrees).
n	No, don't print bright magnitudes-by-components information.
n	No, don't print surface brightness data.
n	No, don't bring back colors.
y	Yes, create LogN vs. LogS plots.
5 and 7	Use the pre-defined "12UM" bandpass (value = 7) and use the pre-defined "K" bandpass (value = 5) [This value is regressed upon, there are two separate SKY4 runs.]
y and n	Yes, plot the cumulative LogN on the y-axis, and no, plot the differential LogN on the y-axis. [This value is regressed upon, there are two separate SKY4 runs.]
y	Plot Magnitudes on x-axis.
n	No, don't plot observed points.

Table E.2: Region Definitions around the LMC

x_FOV (Deg)	Initial Latitude (Deg)	Final Latitude (Deg)	Initial Longitude (Deg)	Final Longitude (Deg)	Step Latitude (Deg)	Step Longitude (Deg)
1.00E+01	-3.70E+01	-2.70E+01	2.76E+02	2.86E+02	1.00E+00	1.00E+00
5.56E+00	-3.48E+01	-2.92E+01	2.78E+02	2.84E+02	5.56E-01	5.56E-01
1.00E+00	-3.25E+01	-3.15E+01	2.81E+02	2.82E+02	1.00E-01	1.00E-01
5.56E-01	-3.23E+01	-3.17E+01	2.81E+02	2.81E+02	5.56E-02	5.56E-02
1.00E-01	-3.21E+01	-3.20E+01	2.81E+02	2.81E+02	1.00E-02	1.00E-02
5.56E-02	-3.20E+01	-3.20E+01	2.81E+02	2.81E+02	5.56E-03	5.56E-03
1.00E-02	-3.20E+01	-3.20E+01	2.81E+02	2.81E+02	1.00E-03	1.00E-03
5.56E-03	-3.20E+01	-3.20E+01	2.81E+02	2.81E+02	5.56E-04	5.56E-04
1.00E-03	-3.20E+01	-3.20E+01	2.81E+02	2.81E+02	1.00E-04	1.00E-04
5.56E-04	-3.20E+01	-3.20E+01	2.81E+02	2.81E+02	5.56E-05	5.56E-05

Table E.3: CBSKY4 Inputs around the LMC.

```
[Path]
architecture = DOS
path=\cbsd4\dataout\cbsky4\ZoomIn_B
-32_L281_12um\
code_path=\cbsd4\cbsd\cbsky4
data_path=\cbsd4\cbsd\sky4data
verbose = YES

[cbsky4]
log_output = ZoomIn_P1.log
map = NO
real_stars = NO
statistical_stars = YES
clouds = YES
magnitude_limit = 15
seed = 346
method = CENTER
catalog = NO
catalog_limit = 10
nodesfile = NODE_IAH.DAT
elementsfile = ELEM_IAH.DAT
extinction = YES
count_statistics = YES
x-axis = MAGNITUDES
y-axis = Differential
errmap = NO
extmap = NO
spectral_type = 0

[convolution]
convolution = NO
point_spread_function = gaussian
psf_half_width = 1.01
```

```
[Image]
Image = YES
output_format = FITS
image_type=4-BYTE REAL
image_projection = RECTANGULAR
x_column_pixels = 1
y_row_pixels = 1
pixel_size = 10.0000000000000
image_center_longitude_degrees =
281.000000000
image_center_latitude = -
32.000000000
units = W/CM2

[Positional]
observer_altitude = 0.0
observer_geographic_latitude = 0.0
observer_geographic_longitude = 0.0
Reference_Frame = B1950
coordinate_system = galactic
positions = apparent
Reference_system = geocentric

[spectral]
start_wavelength =12um
end_wavelength=12um

[Time]
observation_date=2 2 2000
observation_time=0 0 0.0
```

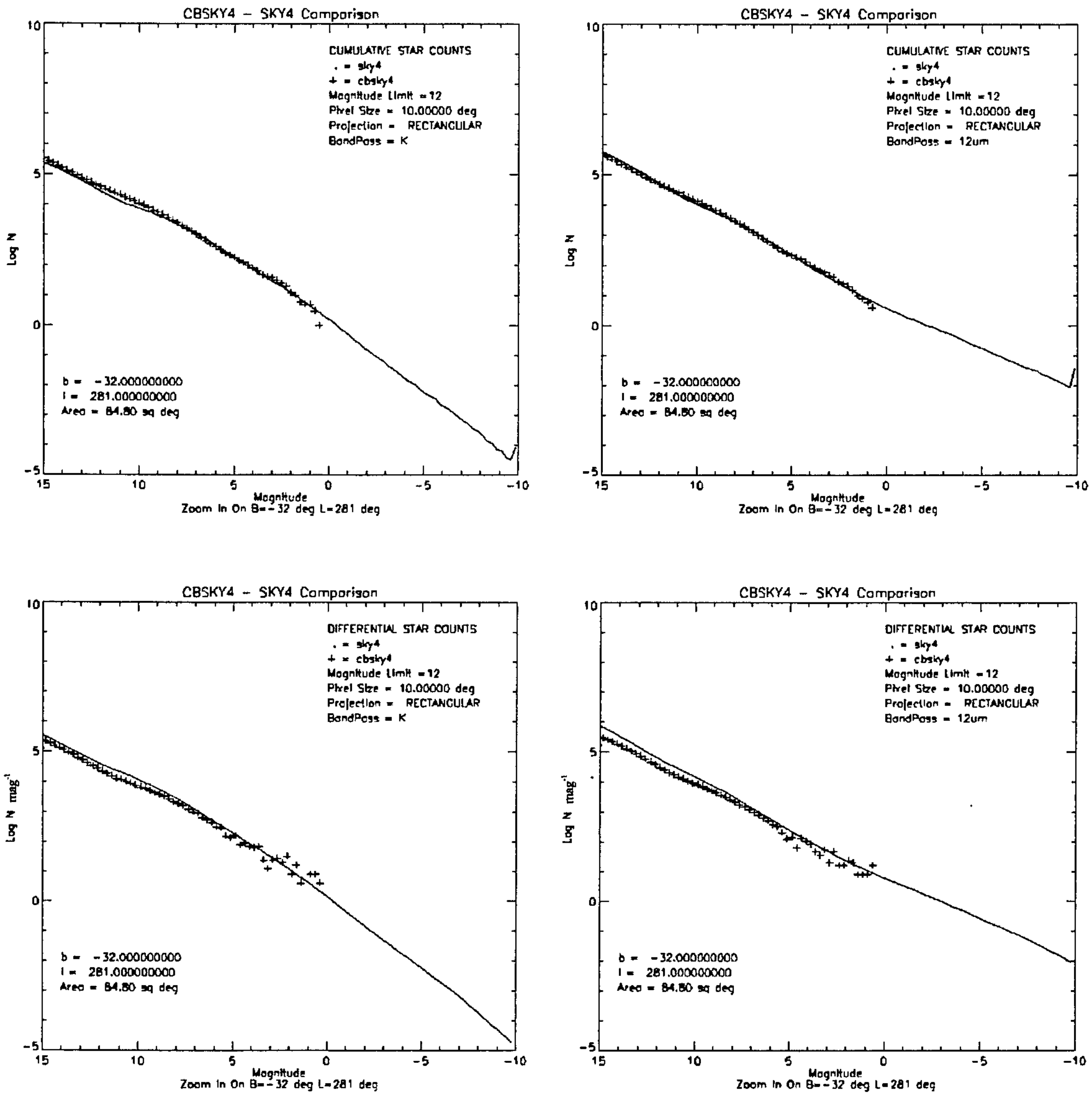


Figure E.1: SKY4 - CBSKY4 comparison for 10.0 deg around the LMC.

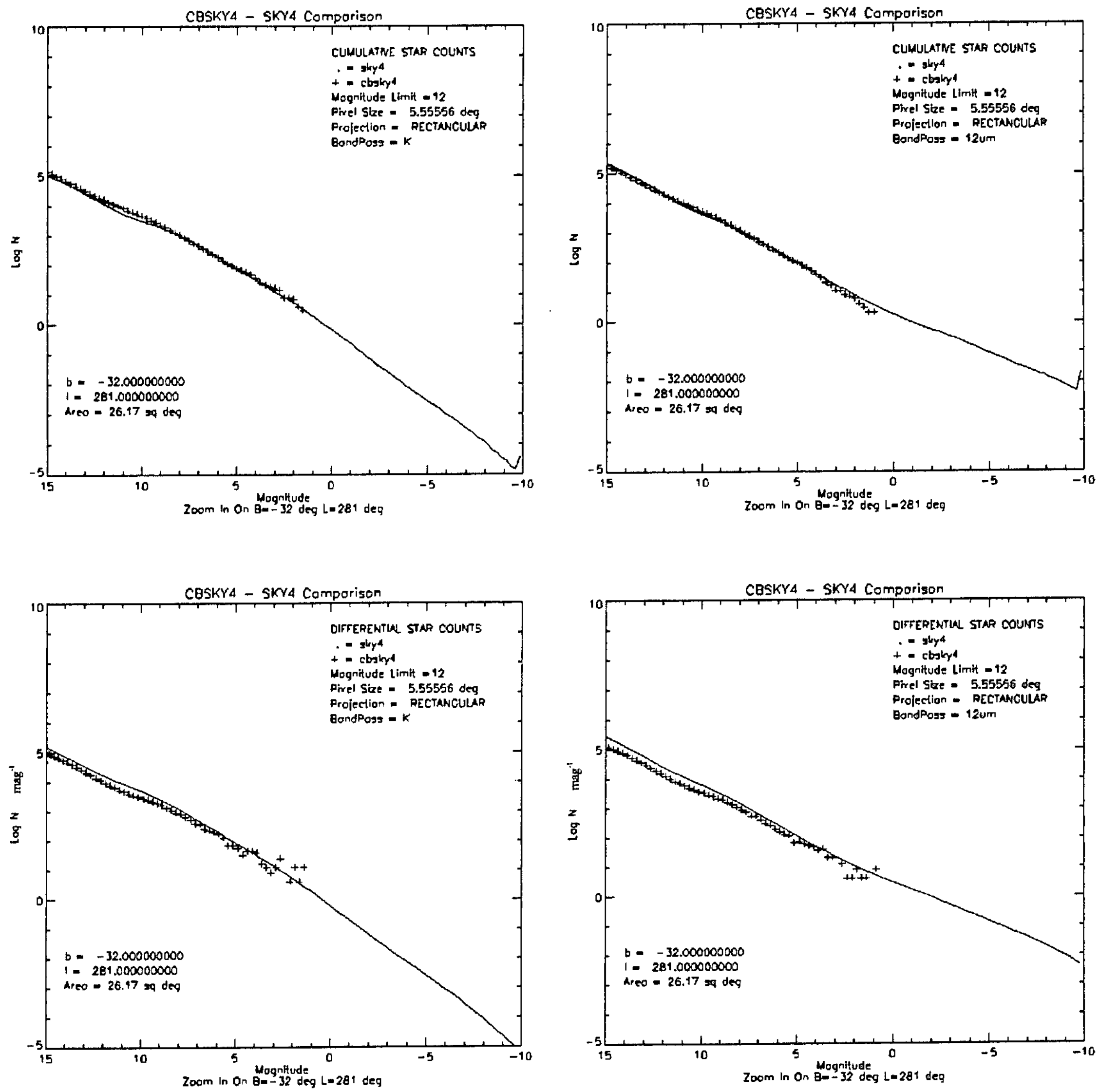


Figure E.2: SKY4 - CBSKY4 comparison for 5.56 deg around the LMC.

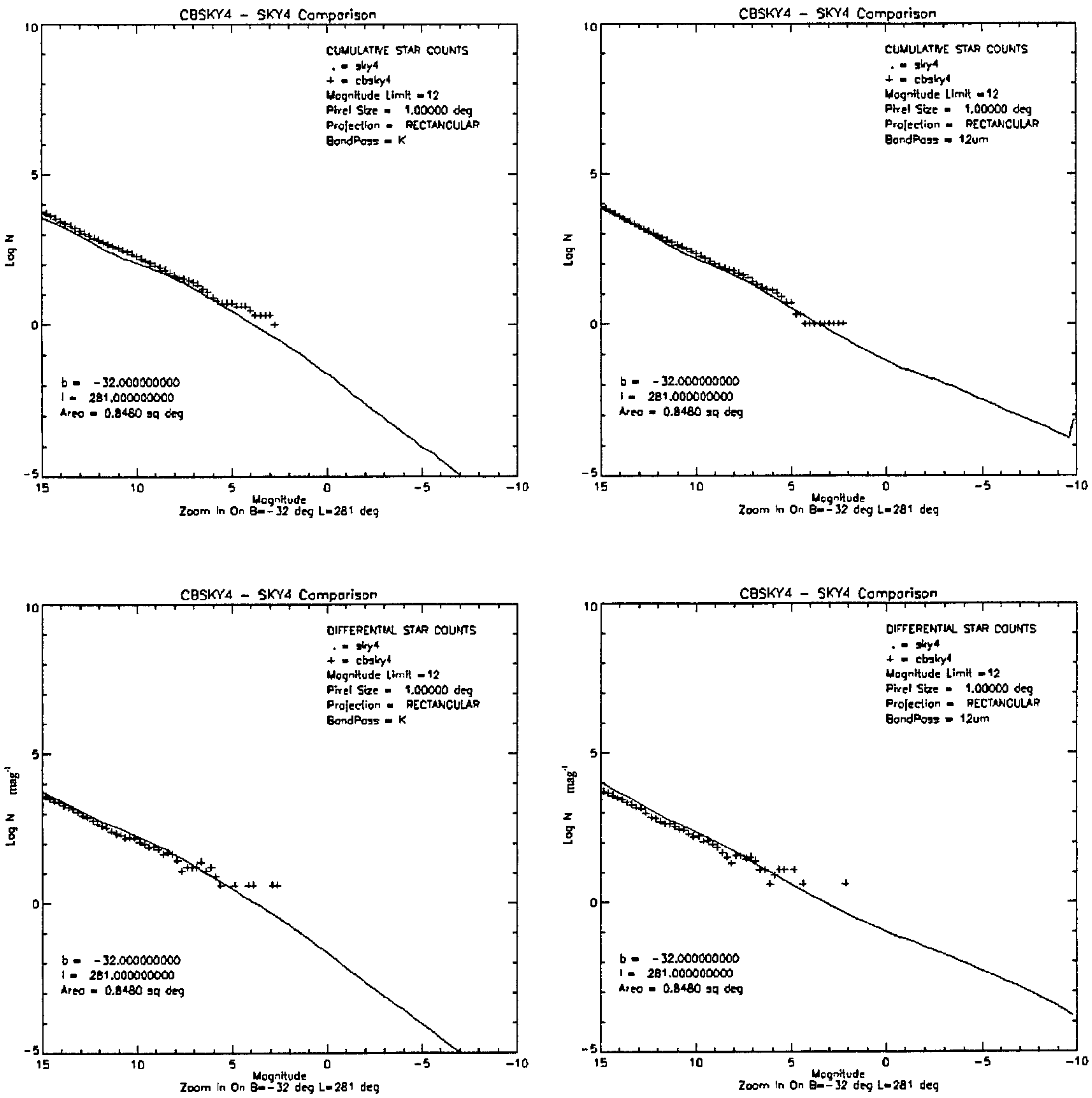


Figure E.3: SKY4 - CBSKY4 comparison for 1.0 deg around the LMC.

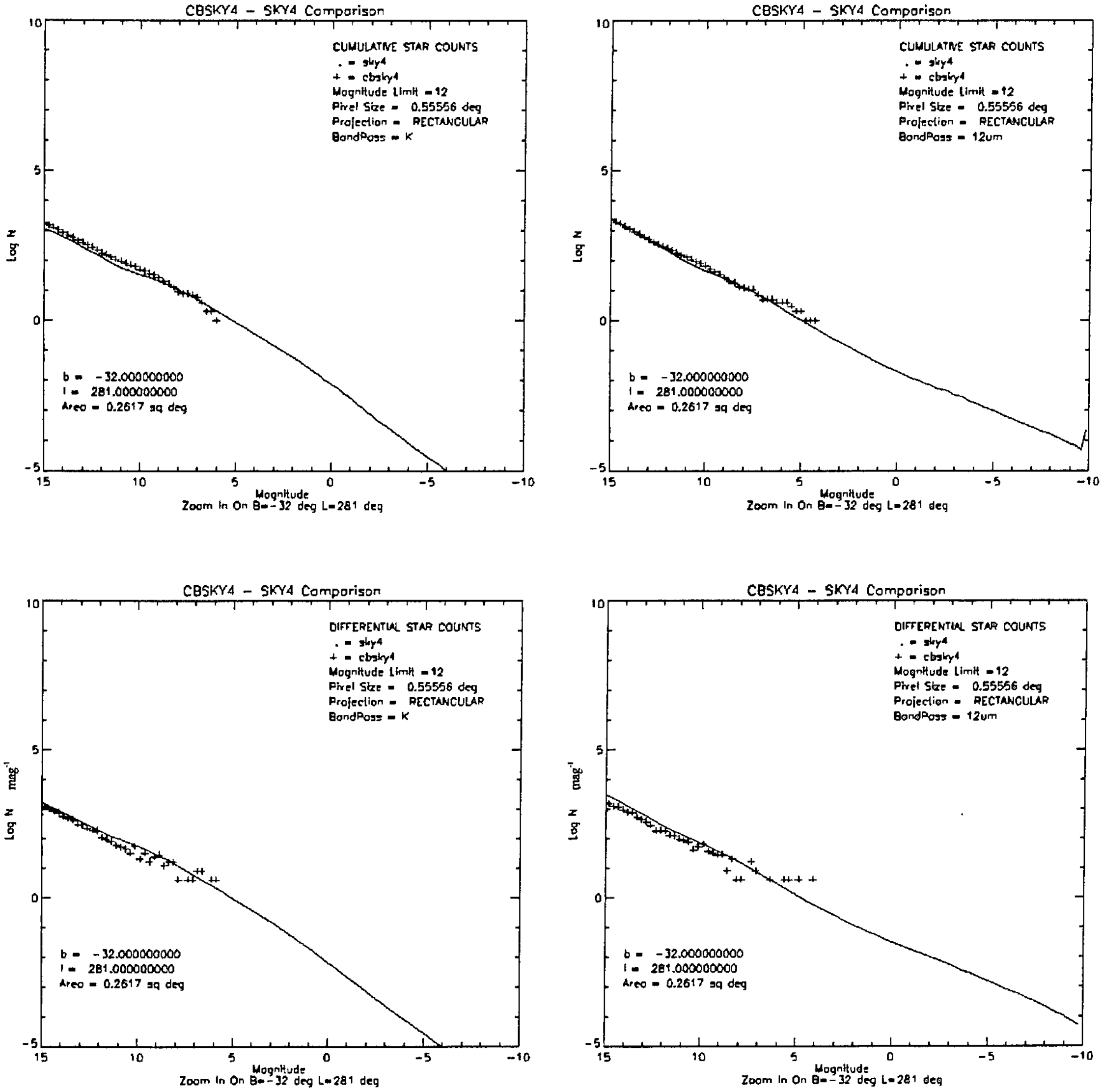


Figure E.4: SKY4 - CBSKY4 comparison for 0.556 deg around the LMC.

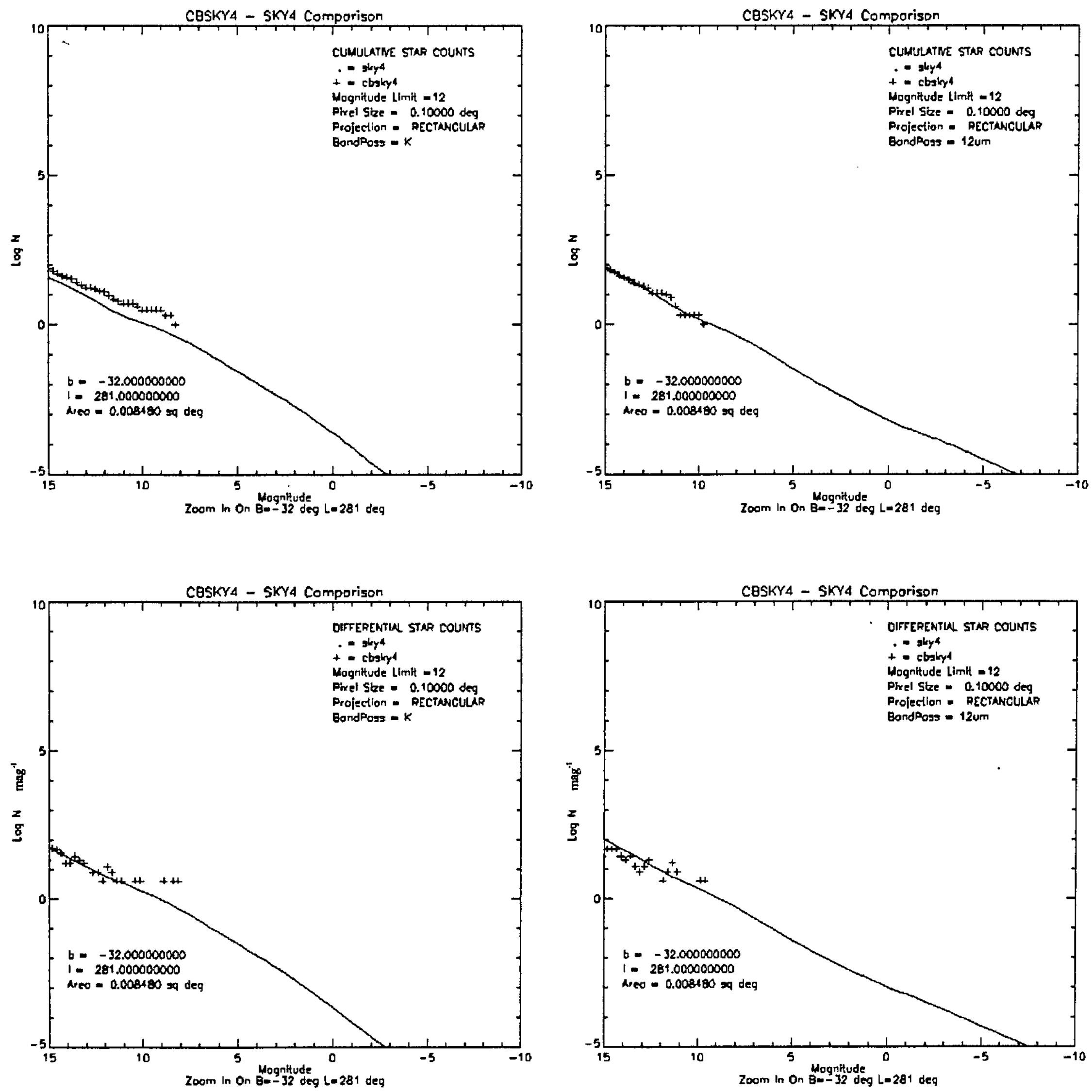


Figure E.5: SKY4 - CBSKY4 comparison for 0.1 deg around the LMC.

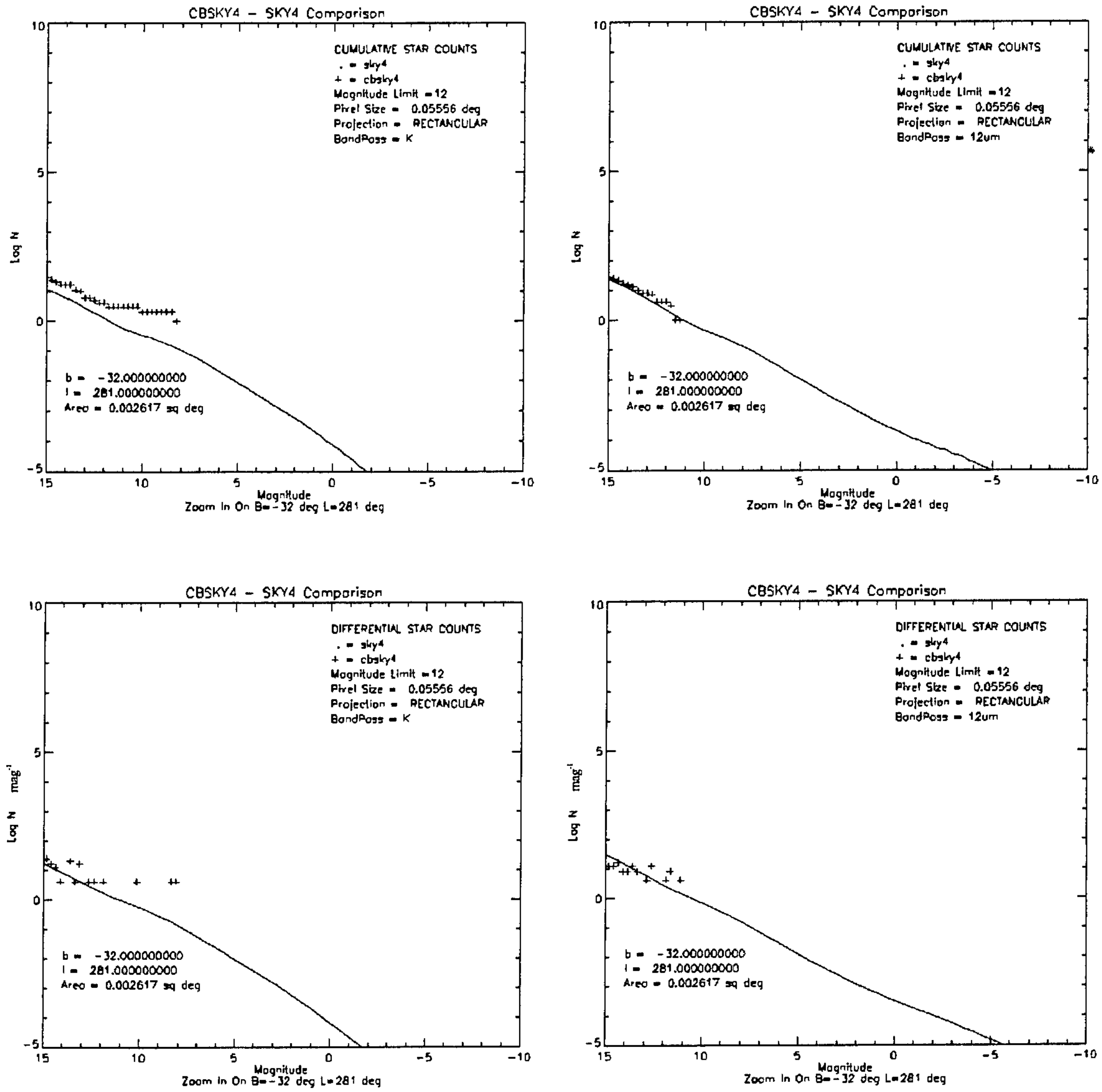


Figure E.6: SKY4 - CBSKY4 comparison for 0.0556 deg around the LMC.

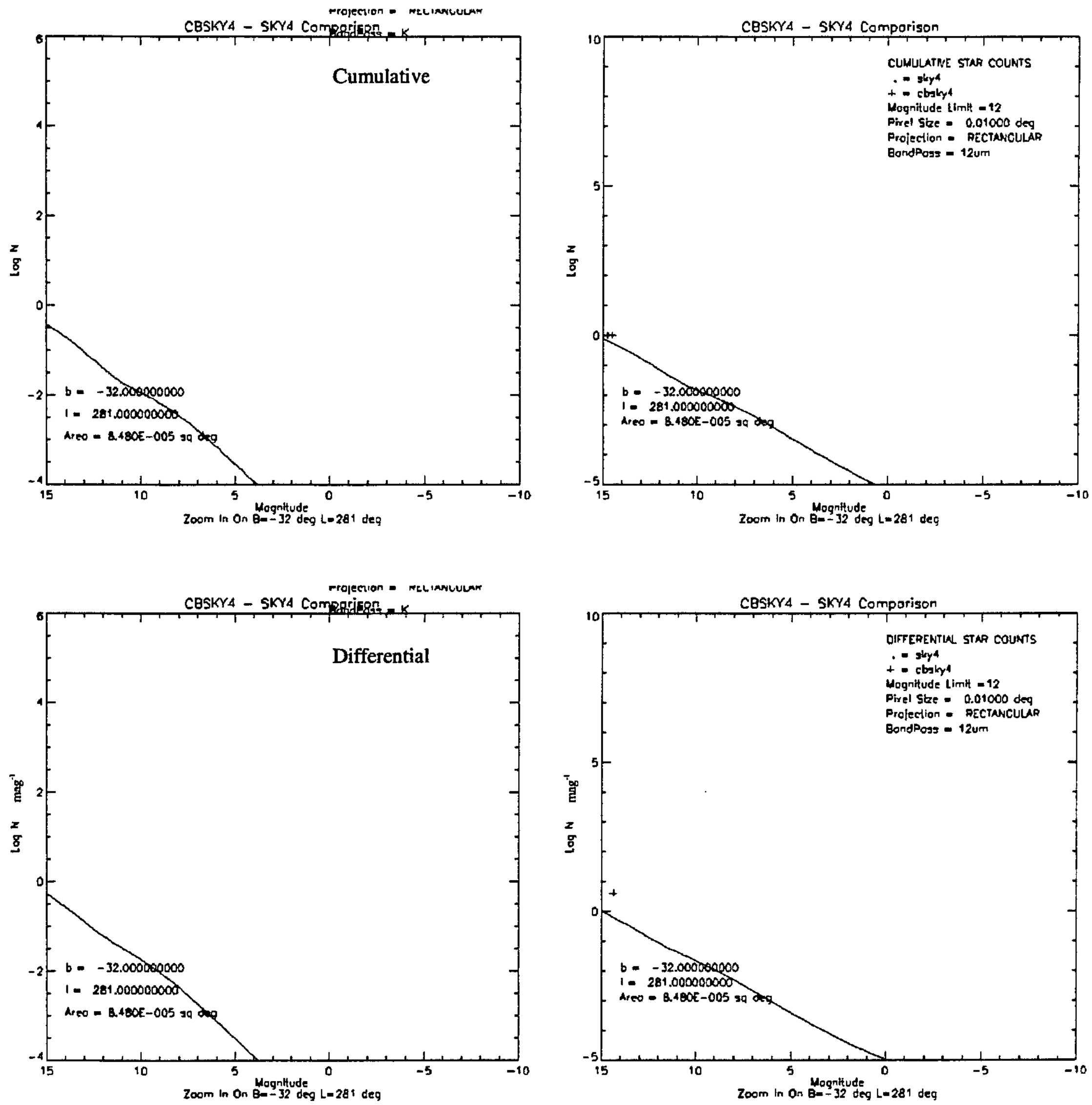


Figure E.7: SKY4 - CBSKY4 comparison for 0.01 deg around the LMC.

Appendix E.2

The region around l = -44 deg, b = 303 deg (the Small Magellanic Cloud) with the following pixel sizes (degrees) for Band K and 12μm:

10.0	5.56	1.0	0.556	0.10
0.0556	0.01	0.00556	0.001	0.000556

Table E.4: Interactive inputs used for the SKY4 runs around the SMC.

Value Used	Description
y	Keep solar displacement of 15 pc N of plane.
y	Integrate over area.
see Table E.5	Limits of galactic latitude in degrees.
see Table E.5	Limits of galactic longitude in degrees.
see Table E.5	Incremental steps in latitude and longitude (in degrees).
n	No, don't print bright magnitudes-by-components information.
n	No, don't print surface brightness data.
n	No, don't bring back colors.
y	Yes, create LogN vs. LogS plots.
5 and 7	Use the pre-defined "12UM" bandpass (value = 7) and use the pre-defined "K" bandpass (value = 5) [This value is regressed upon, there are two separate SKY4 runs.]
y and n	Yes, plot the cumulative LogN on the y-axis, and no, plot the differential LogN on the y-axis. [This value is regressed upon, there are two separate SKY4 runs.]
y	Plot Magnitudes on x-axis.
n	No, don't plot observed points.

Table E.5: Region Definitions around the SMC.

x_FOV (Deg)	Initial Latitude (Deg)	Final Latitude (Deg)	Initial Longitude (Deg)	Final Longitude (Deg)	Step Latitude (Deg)	Step Longitude (Deg)
1.00E+01	-4.90E+01	-3.90E+01	2.98E+02	3.08E+02	1.00E+00	1.00E+00
5.56E+00	-4.68E+01	-4.12E+01	3.00E+02	3.06E+02	5.56E-01	5.56E-01
1.00E+00	-4.45E+01	-4.35E+01	3.03E+02	3.04E+02	1.00E-01	1.00E-01
5.56E-01	-4.43E+01	-4.37E+01	3.03E+02	3.03E+02	5.56E-02	5.56E-02
1.00E-01	-4.41E+01	-4.40E+01	3.03E+02	3.03E+02	1.00E-02	1.00E-02
5.56E-02	-4.40E+01	-4.40E+01	3.03E+02	3.03E+02	5.56E-03	5.56E-03
1.00E-02	-4.40E+01	-4.40E+01	3.03E+02	3.03E+02	1.00E-03	1.00E-03
5.56E-03	-4.40E+01	-4.40E+01	3.03E+02	3.03E+02	5.56E-04	5.56E-04
1.00E-03	-4.40E+01	-4.40E+01	3.03E+02	3.03E+02	1.00E-04	1.00E-04
5.56E-04	-4.40E+01	-4.40E+01	3.03E+02	3.03E+02	5.56E-05	5.56E-05

Table E.6: CBSKY4 Inputs around the SMC.

```
[Path]
architecture = DOS
path=\cbsd4\dataout\cbsky4\ZoomIn_B-
44_L303_12um\
code_path=\cbsd4\cbsd\cbsky4
data_path=\cbsd4\cbsd\sky4data
verbose = YES

[cbsky4]
log_output = ZoomIn_P1.log
map = NO
real_stars = NO
statistical_stars = YES
clouds = YES
magnitude_limit = 15
seed = 346
method = CENTER
catalog = NO
catalog_limit = 10
nodesfile = NODE_IAH.DAT
elementsfile = ELEM_IAH.DAT
extinction = YES
count_statistics = YES
x-axis = MAGNITUDES
y-axis = Differential
errmap = NO
extmap = NO
spectral_type = 0

[convolution]
convolution = NO
point_spread_function = gaussian
psf_half_width = 1.01
```

```
[Image]
Image = YES
output_format = FITS
image_type=4-BYTE REAL
image_projection = RECTANGULAR
x_column_pixels = 1
y_row_pixels = 1
pixel_size = 10.0000000000000
image_center_longitude_degrees =
303.000000000
image_center_latitude = -44.000000000
units = W/CM2

[Positional]
observer_altitude = 0.0
observer_geographic_latitude = 0.0
observer_geographic_longitude = 0.0
Reference_Frame = B1950
coordinate_system = galactic
positions = apparent
Reference_system = geocentric

[spectral]
start_wavelength =12um
end_wavelength=12um

[Time]
observation_date=2 2 2000
observation_time=0 0 0.0
```

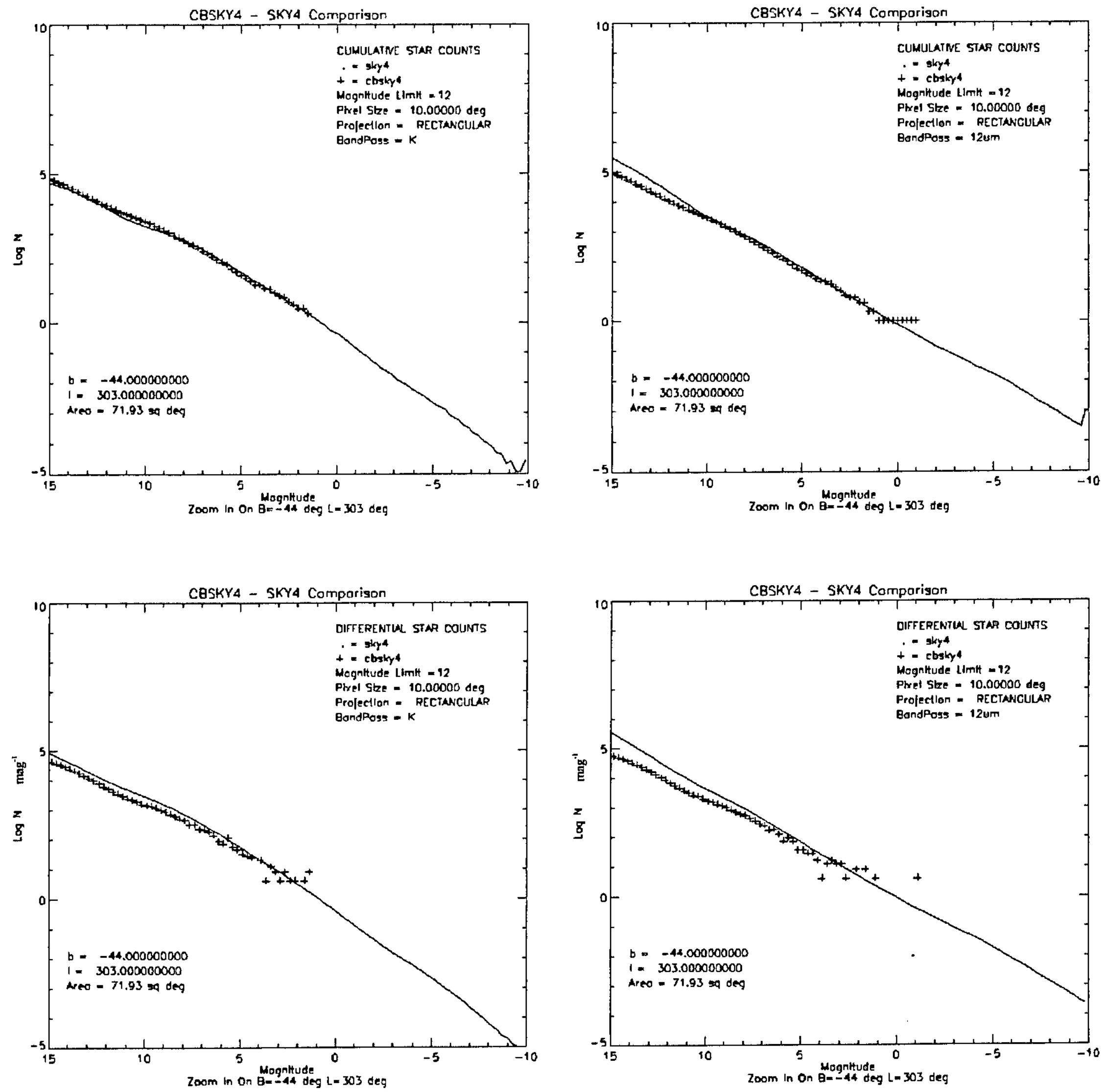


Figure E.8: SKY4 - CBSKY4 comparison for 10.0 deg around the SMC.

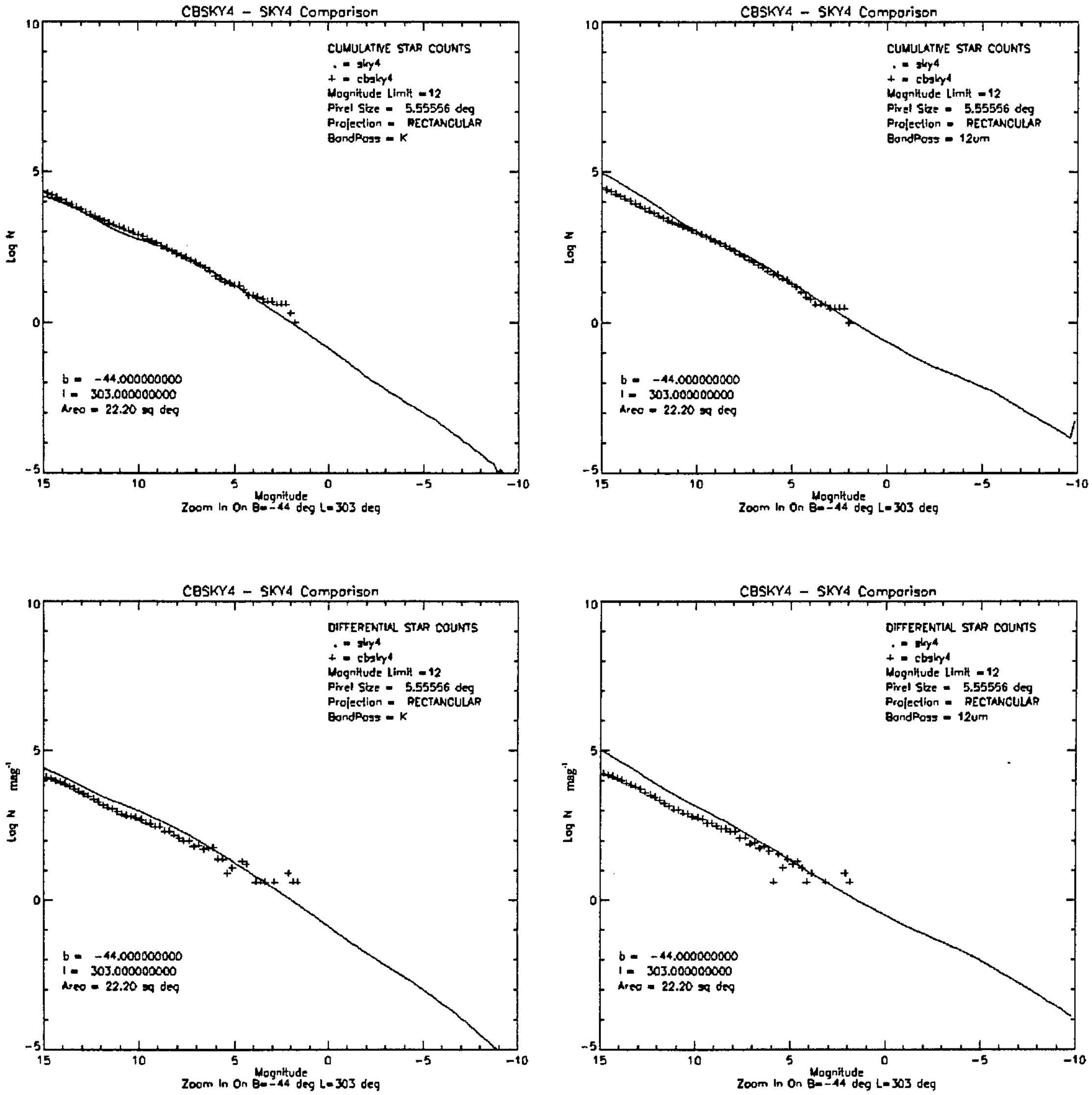


Figure E.9: SKY4 - CBSKY4 comparison for 5.56 deg around the SMC.

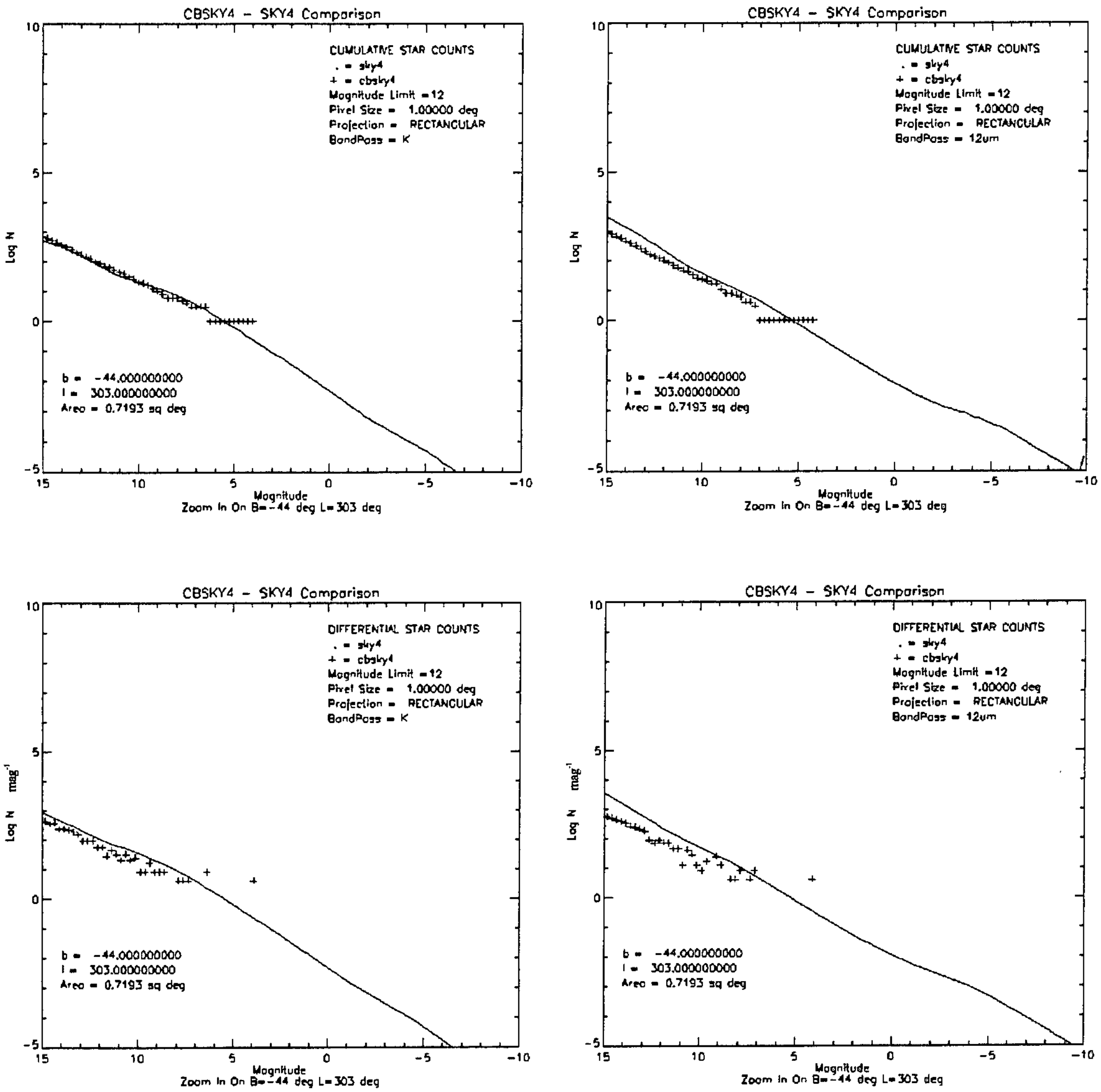


Figure E.10: SKY4 - CBSKY4 comparison for 1.0 deg around the SMC.

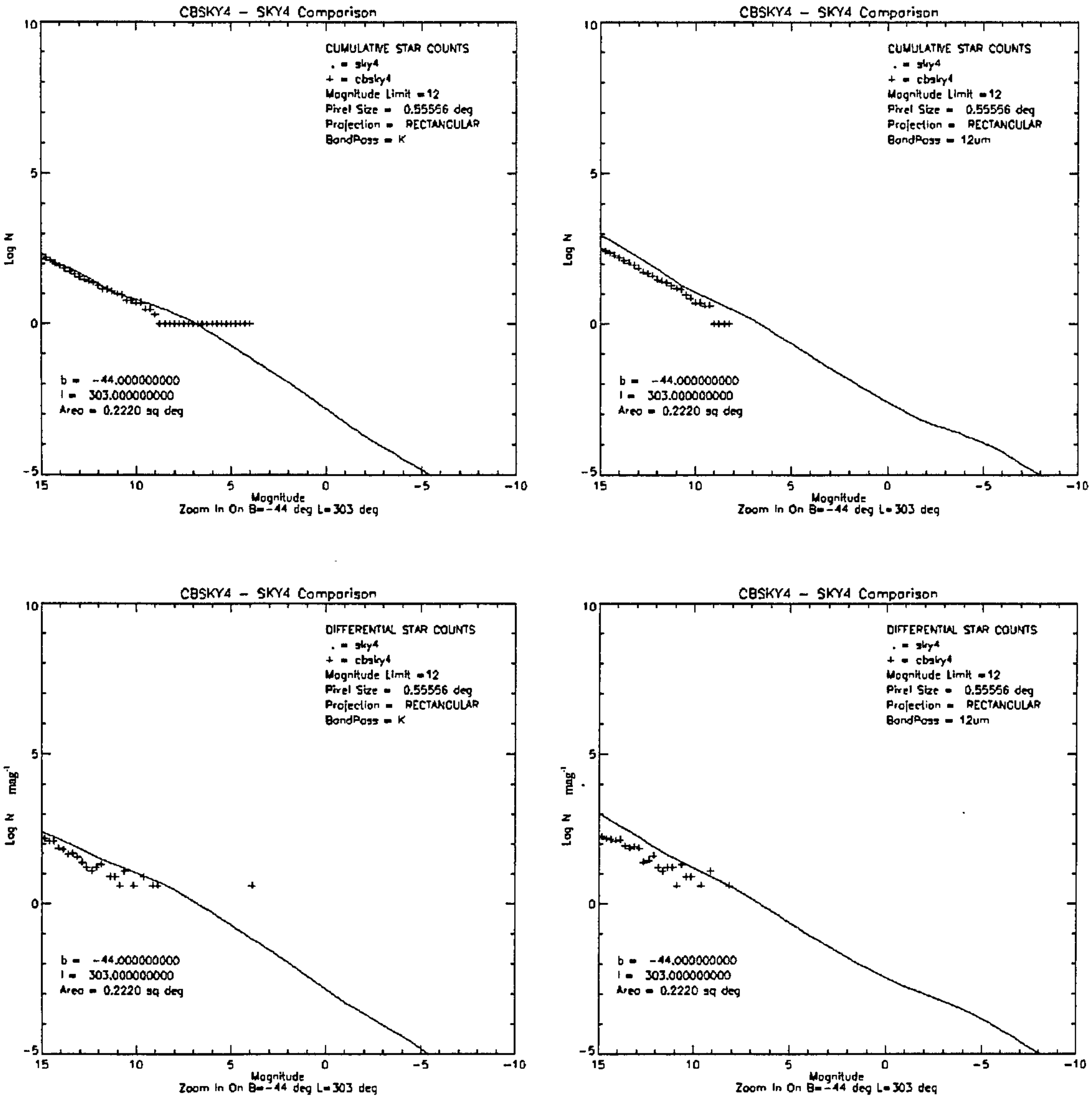


Figure E.11: SKY4 - CBSKY4 comparison for 0.556 deg around the SMC.

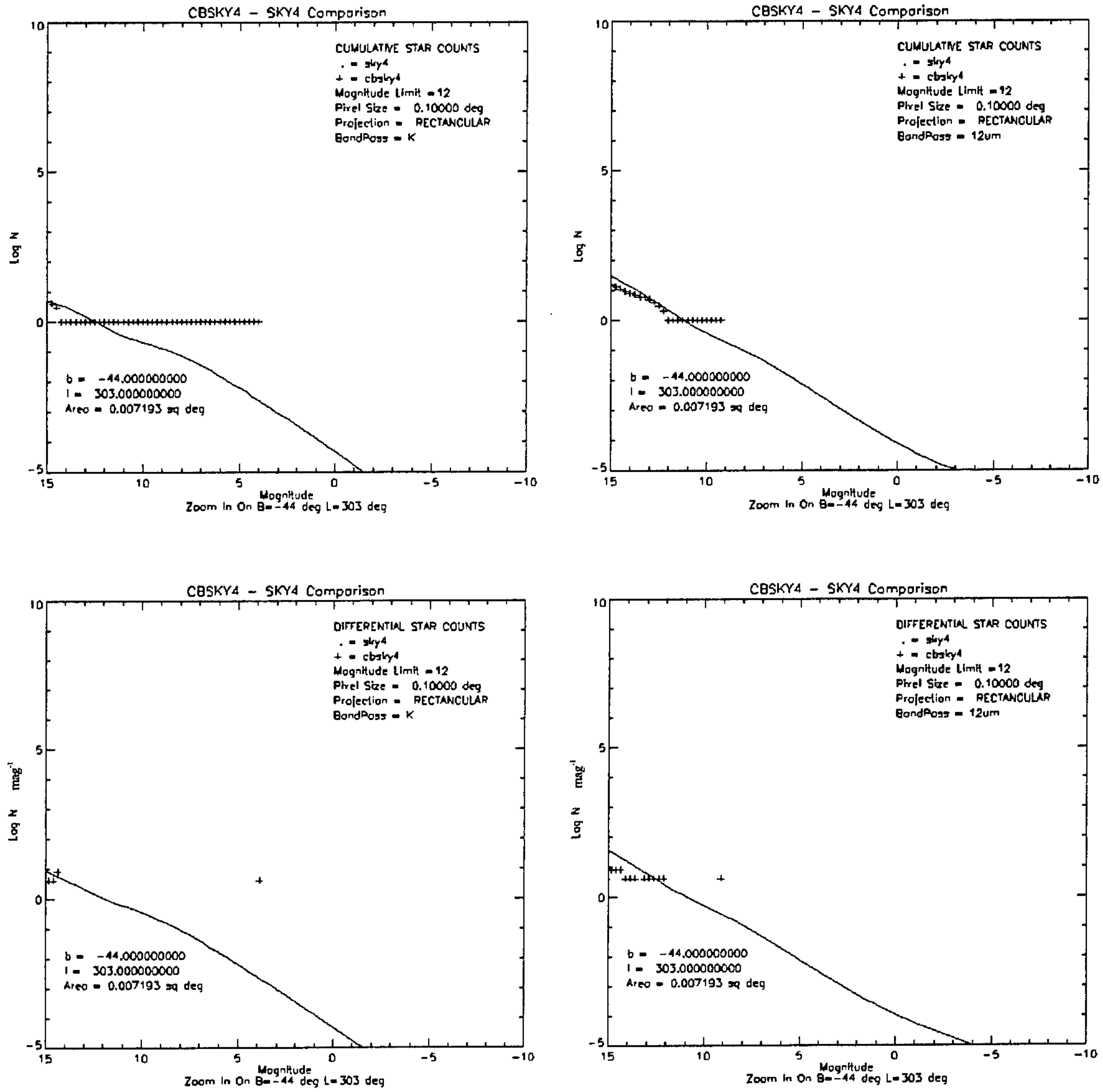


Figure E.12: SKY4 - CBSKY4 comparison for 0.1 deg around the SMC.

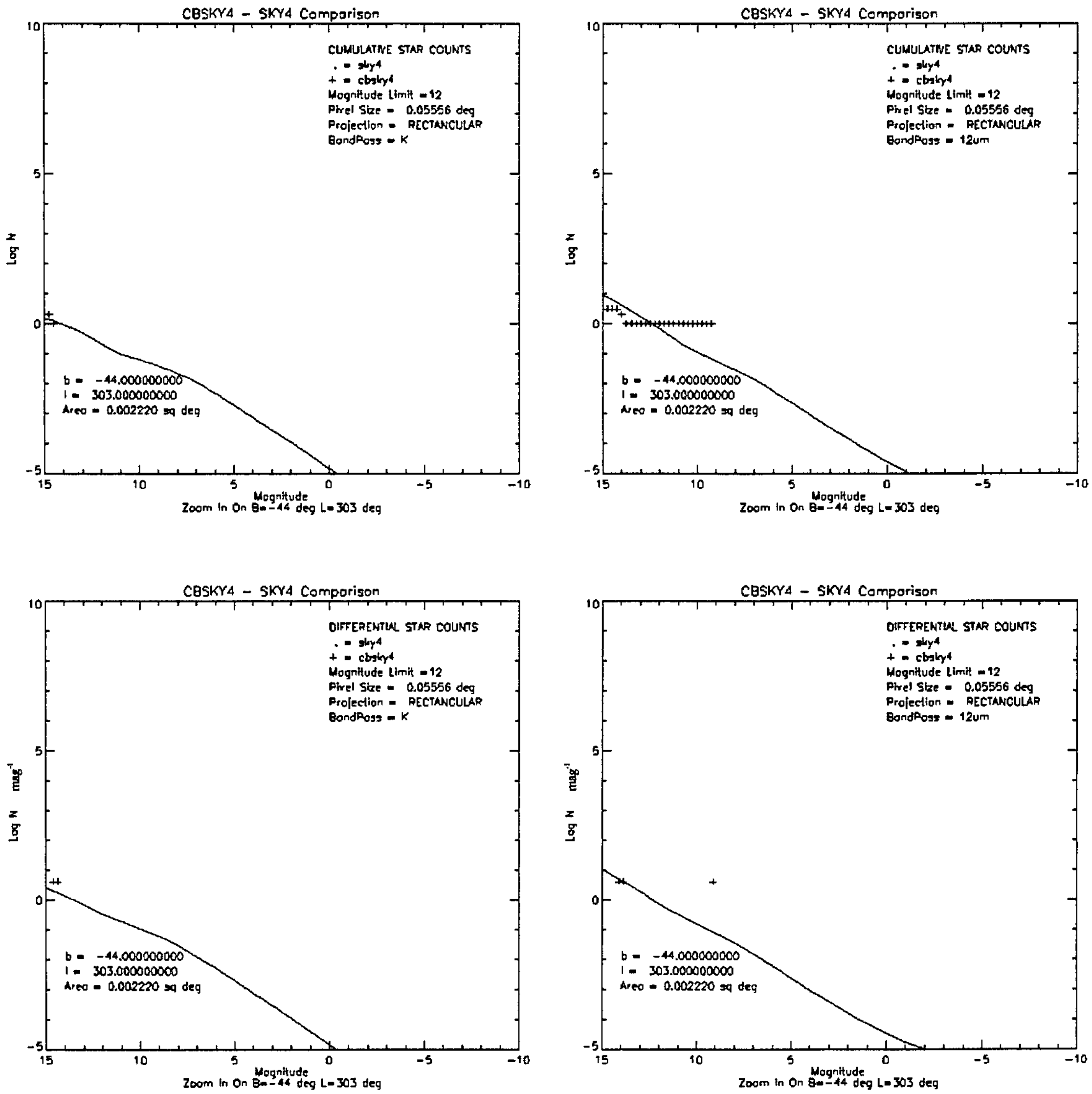


Figure E.13: SKY4 - CBSKY4 comparison for 0.0556 deg around the SMC.

Appendix F

Orion Example Input File

Table F.1: Input File for the Orion Image (Visible Band, Catalog Output)

[Path] architecture = DOS log_output = Orion_V.log path=\CBSD4\dataout\CBSKY4\ code_path=\CBSD4\CBSD\CBSKY4 data_path=\CBSD4\CBSD\sky4data verbose = YES [CBSKY4] catalog = YES catalog_limit = 3 clouds = NO count_statistics = YES elementsfile = ELEM_IAH.DAT errmap = NO extinction = NO extmap = NO magnitude_limit = 15 map = YES method = CENTER nodesfile = NODE_IAH.DAT real_stars = YES seed = 346 statistical_stars = NO x-axis = MAGNITUDES y-axis = Cumulative [convolution] convolution = YES point_spread_function = gaussian psf_half_width = 1.1	[Image] Image = YES output_format = FITS image_type=4-BYTE REAL image_projection = RECTANGULAR x_column_pixels = 400 y_row_pixels = 500 pixel_size = 0.08 image_center_longitude_degrees = 82.5000 image_center_latitude = 5.0 units = W/CM2 [Positional] observer_altitude = 0.0 observer_geographic_latitude = - 10.166850 observer_geographic_longitude = 189.54477 Reference_Frame = B1950 coordinate_system = equatorial positions = apparent Reference_system = geocentric [spectral] start_wavelength = V end_wavelength= V [Time] observation_date=2 2 2000 observation_time=0 0 0.0

This was run for different band passes, and different options of statistical or real stars to produce the output in this report.

Appendix G

Arcturus Example Input File

Table G.1: Input File for the Arcturus Image (User-Specified Band, Catalog Output)

[Path] architecture = DOS path=\cbsd4\dataout\cbsky4\AlphaBooSpectra\ code_path=\cbsd4\cbsd\cbsky4 data_path=\cbsd4\cbsd\sky4data verbose = YES [cbsky4] log_output = Case_1.log map = NO real_stars = YES statistical_stars = NO clouds = NO magnitude_limit = 12 seed = 346 method = CENTER catalog = YES catalog_limit = 2 nodesfile = NODE_IAH.DAT elementsfile = ELEM_IAH.DAT extinction = YES count_statistics = YES x-axis = MAGNITUDES y-axis = Cumulative errmap = NO extmap = NO spectral_type = 0 [convolution] convolution = NO point_spread_function = gaussian psf_half_width = 1.01	[Image] Image = YES output_format = FITS image_type=4-BYTE REAL image_projection = Rectangular x_column_pixels = 21 y_row_pixels = 21 pixel_size = .00027 image_center_longitude_degrees = 213.919 image_center_latitude = 19.1895 units = W/CM2 [Positional] observer_altitude = 0.0 observer_geographic_latitude = 0.0 observer_geographic_longitude = 0.0 Reference_Frame = J2000 coordinate_system = equatorial positions = apparent Reference_system = geocentric [Spectral] start_wavelength =2.000 end_wavelength=2.200 [Time] observation_date=2 2 2000 observation_time=0 0 0.0

This was run for different band passes, and different image and convolution options to produce the output of this report.